15 APRIL '43

Regd. No. 1155.

THE MADRAS AGRICULTURAL JOURNAL

XXXI. March 1943. No. 3

CONTENTS

Published by

THE MADRAS AGRICULTURAL STUDENTS' UNION,
Agricultural College and Research Institute,
Coimbatore, S. India.

Annual Subscription Inland Rs. 4-0.
" " Foreign Rs. 4-8.

Single Copy, As. 6.

Regd. No. 1155.

5-7-43

THE MADRAS AGRICULTURAL JOURNAL

XXXI. April 1943. No. 4.

CONTENTS

Published by

THE MADRAS AGRICULTURAL STUDENTS' UNION,
Agricultural College and Research Institute,
Coimbatore, S. India.

Annual Subscription Inland Rs. 4-0.
" " Foreign Rs. 4-8.

Single Copy
As. 6.

3-7-43

Regd. No. 1155.

THE MADRAS AGRICULTURAL JOURNAL

XXXI. May 1943. No. 5.

CONTENTS

Published by

THE MADRAS AGRICULTURAL STUDENTS' UNION,
Agricultural College and Research Institute,
Coimbatore, S. India.

Annual Subscription Inland Rs. 4-0. Single Copy
" " Foreign Rs. 4-8. As. 6.

Regd. No. 1155.

THE MADRAS AGRICULTURAL JOURNAL

SPECIAL NUMBER

WITH

STUDENTS' ANNUAL SUPPLEMENT

XXXI. June 1943. No. 6

CONTENTS

Published by

THE MADRAS AGRICULTURAL STUDENTS' UNION,
Agricultural College and Research Institute,
Coimbatore, S. India.

Annual Subscription Inland Rs. 4-0. Foreign Rs. 4-8.

Single Copy As. 6.

Regd. No. 1155.

THE MADRAS AGRICULTURAL JOURNAL

XXXI. July 1943. No. 7.

CONTENTS

Published by

THE MADRAS AGRICULTURAL STUDENTS' UNION,
Agricultural College and Research Institute,
Coimbatore, S. India.

Annual Subscription Inland Rs. 4-0. Single Copy
" " Foreign Rs. 4-8. As. 6.

Regd. No. 1155.

THE MADRAS AGRICULTURAL JOURNAL

XXXI. August 1943. No. 8.

CONTENTS

Published by

THE MADRAS AGRICULTURAL STUDENTS' UNION,
Agricultural College and Research Institute,
Coimbatore, S. India.

Annual Subscription Inland Rs. 4-0.
" " Foreign Rs. 4-8.

Single Copy As. 6.

Regd. No. 1155.

THE MADRAS AGRICULTURAL JOURNAL

PUBLISHED BY THE M. A. S. UNION,
Agricultural College and Research Institute, Coimbatore, S. India.

Vol. No. XXXI October 1943. No. 10.

CONTENTS

Annual Subscription Inland Rs. 4-0-0. Foreign Rs. 4-8-0. Single Copy As 6.

Advertisement rates for single insertion:

Full page Rs. 6-0-0. Half page Rs. 3-8-0. Quarter page Rs. 2-0-0.

25 per cent extra for inside cover page and 50 per cent for outside cover page

Liberal discount for standing matter. Charges are *payable in advance*.

Contributions to the Journal: Contributions, queries and correspondence are invited. Manuscripts should be legibly written or typed out. Twenty five copies of reprints of original articles will be presented to the authors. *Extra copies and printed covers for the reprints*, will be supplied at actual cost, if intimation is given when the manuscript is presented.

Please address correspondence to:

The Secretary, M A S. Union, Lawley Road P. O., Coimbatore, S. India.

Regd. No. 1155.

THE MADRAS AGRICULTURAL JOURNAL

PUBLISHED BY THE M. A. S. UNION,
Agricultural College and Research Institute, Coimbatore, S. India.

Vol. No. XXXI November 1943. No. 11.

CONTENTS

Annual Subscription Inland Rs. 4-0-0: Foreign Rs. 4-8-0. Single Copy As 6.

Advertisement rates for single insertion :

Full page Rs. 6-0-0. Half page Rs 3-8-0. Quarter page Rs. 2-0-0.

25 per cent extra for inside cover page and 50 per cent for outside cover page.

Liberal discount for standing matter. Charges are *payable in advance*

Contributions to the Journal: Contributions, queries and correspondence are invited. Manuscripts should be legibly written or typed out. Twenty five copies of reprints of original articles will be presented to the authors. *Extra copies and printed covers for the reprints*, will be supplied at actual cost, if intimation is given when the manuscript is presented.

Please address correspondence to :

The Secretary, M. A. S. Union, Lawley Road P. O., Coimbatore, S. India.

Regd. No. 1155.

THE MADRAS AGRICULTURAL JOURNAL

PUBLISHED BY THE M. A. S. UNION,
Agricultural College and Research Institute, Coimbatore, S. India.

Vol. No. XXXI December 1943. No. 12.

CONTENTS

Annual Subscription Inland Rs. 4-0-0. Foreign Rs 4-8-0. Single Copy As 6.

Advertisement rates for single insertion:

Full page Rs. 6-0-0. Half page Rs 3-8-0. Quarter page Rs. 2-0-0.

25 per cent extra for inside cover page and 50 per cent for outside cover page.

Liberal discount for standing matter. Charges are *payable in advance.*

Contributions to the Journal: Contributions, queries and correspondence are invited. Manuscripts should be legibly written or typed out. Twenty five copies of reprints of original articles will be presented to the authors. *Extra copies and printed covers for the reprints,* will be supplied at actual cost, if intimation is given when the manuscript is presented.

Please address correspondence to:

The Secretary, M. A. S. Union, Lawley Road P. O., Coimbatore, S. India.

The Madras Agricultural Journal.

(ORGAN OF THE M. A. S. UNION)

Vol. XXXI JANUARY 1943 No. 1.

EDITORIAL

The Food Situation It is one of the most significant features of this war, that in the matter of food production, the Allies are at a distinct advantage over the enemy. In the continent of Europe, the sole source of food supply to the Germans, crop production has suffered a terrible set-back. In the occupied regions millions of cattle have been slaughtered for providing food for the Nazis, and Holland, Denmark and France have been depleted of their dairy herds. Even Switzerland with her magnificent milk cattle has not escaped a similar fate. What remaining cattle there are, are in a state of semi-starvation owing to lack of feed and have virtually ceased to be productive. Norway's fishing industry is at a stand still as the enemy has deprived her of her fishing fleets. The entire wheat area of Europe, trampled under the heel of the marching hordes of the belligerent armies has been rendered desolate and unproductive. Famine stalks the land and disease and pestilence are taking their heavy toll. From North Cape to Lisbon and from Greece to Finland, the people are undergoing hardships as never before in history On the other hand, food production in the allied countries has received a tremendous impetus since the war. In Canada and the United States, the surpluses of wheat from past harvests, are finding a market, hitherto denied to them. Almost every empire country has redoubled its efforts with regard to food production and plentiful harvests have been the result. Notwithstanding the submarine menace, and the sinking of considerable quantities of cargo, Britain and her allies have been able to maintain the morale of her fighting men and civil population without any difficulty.

In India, the beginning of the past year saw an acute distress in regard to food, owing to crop failure in the previous season and the occupation of Burma by the Japanese, which cut off our rice supplies from that source. Added to this, was the inevitable concommitants of war, namely, loss of imports, black markets, unbalanced distribution, transport difficulties and profiteering which aggravated the situation, and hindered production. But thanks to the promptitude and vigilance of the Central and Provincial Governments, vigorous steps were taken to increase food production and regulate its distribution. A "grow more food" campaign was

organised throughout the country, which bore good results. Considerable improvement was effected in providing transport facilities for conveyance of food. Profiteering was checked by control of prices in certain essential commodities. Regional self-sufficiency was encouraged and cultivators were given concessions to increase their output. Thus in a short time, the situation in the country as a whole, improved and the goal set at the beginning of the year to increase the acreage under rice and millets by 7·6 million acres has been reached according to Sir Jogendra Singh, Member for Education, Health and Lands. The total acreage under rice has been increased from 73 millions to 75·6 and millets from 51 millions to 56 millions.

During the current season, crop production has been adversely affected in many areas. There has been partial failure of the crop in many parts of the Madras and Bombay presidencies for want of timely rains. Cyclone and flood have been contributory factors to loss of crop in parts of Bengal and Orissa. It is considered, however, that these adverse factors have not in themselves caused more than temporary local shortage and measures are being taken by the Central Government to make good the deficiency of food grains by importing large quantities of wheat from Australia, and to for the more effective mobilisation and distribution of exportable surpluses from the producing provinces to the needy areas.

In this connection, we make an earnest appeal to the agriculturists and traders dealing in food grains, to release their surplus stocks at once to the market and co-operate with the Government in its efforts to ease the situation in the country. There could be no justification for hoarding even in normal times, and much less so in times of stress as at present. Moreover, the recent priority preference for food grain transport should go a long way to remove obstacles in the way of merchants clearing away their stocks. We hope, therefore, that with the co-operation of the public, the food situation will be considerably better in the future than in the recent past.

New Year Honours We are glad to note that in the new year honours Rao Bahadur B. Viswanath, Director of the Imperial Institute of Agricultural Sesearch, New Delhi, has been awarded the insignia of C. I. E. and Mr. R. Thomas, Assistant Sugarcane Expert, Imperial Sugarcane Station, Coimbatore, the title of Rao Saheb. Rao Bahadur Viswanath was actively connected with the Madras Agricultural Students' Union during the time he was at Coimbatore having been its Secretary and Vice-President and the Editor of this journal. Mr. R. Thomas has been associated in cane-breeding work with Sir T. S. Venkataraman, ever since the inception of the breeding station at Coimbatore. We extend our felicitations to both the recipients.

Soil Erosion and Conservation of Moisture in Un-Irrigated Black Soils

By A. SUBBA RAO, M. A., M. Sc., D. Sc., F. Inst. P.
Soil Physicist, Dry Farming Station, Bellary

Lecture No. 1*

Soil Erosion is a subject that is receiving world-wide attention today. Although erosion has been going on for centuries, it is recognised that it has begun to assume serious proportions in recent years. America may be said to be the foremost country in the collection and dissemination of knowledge concerning this problem. Through a chain of experimental stations which deal exclusively with the problem of soil erosion in all its varied aspects, a large mass of data is collected and the results made available to the farmers through a series of scientific articles, pamphlets and other publications; wide publicity is given to such results. Farmers are encouraged to form soil conservation districts, which on co-operative lines practise the various control measures advocated by the officers of the Soil Conservation Service, under their expert guidance and advice. The Soil Conservation Service deals comprehensively with the problem of erosion from the agricultural, forestry, engineering and other points of view. The quantity of soil washed down the great river systems of America annually is computed in millions of tons of soil. Some of the erosion surveys of the United States as a whole showed that 35 millions of acres have already been destroyed; out of the 350 millions of acres under cultivation, 125 millions have lost most of their surface soil and 100 millions are eroding seriously. It is stated that at the present rate of soil and water depletion the fertile soil in America will be reduced in another 50 years to a fourth of what it is now. These are some of the results of the erosion surveys of the United States.

In India no such computations of the losses of soil fertility are yet available. According to Dr. L. Dudley Stamp, an authority on land utilisation matters, the problem of soil erosion in Africa is of recent origin, but is assuming very serious proportions as a result of the intensive exploitation of the land for purposes of agriculture. The native system of cultivation known as 'Bush fallowing', which is also called 'shifting cultivation', is best suited to the country. A period of cultivation is usually followed by a long period of fallow—usually 7 to 10 years, during which bushes and trees grow. These form a natural protection against erosion. It is only when the period of fallow is reduced and clean ploughing, clean weeding,

* Two lectures delivered under the auspices of the University of Madras—Maharajah of Travancore Curzon (Endowment) Lectures in Agriculture, 1941-42, at the Agricultural College, Coimbatore. The lectures were illustrated with slides.

extensive clearing and such other practices are introduced, erosion is excessive.

A knowledge of certain facts fundamental to the problem of erosion is essential for a proper understanding of the subject. Soil erosion is caused by the action of wind or water in motion. The average depth of soil in the world is estimated to be about 6 to 12 inches. At some places it is deeper and at others shallower. It is this thin layer of soil resting on a rocky core that is responsible for all plant growth and that supports all animal and human life. It is as essential for life on this planet as air, water or sunlight. It is therefore our primary duty to protect this layer of soil and see that its fertility is well preserved.

Under the natural undisturbed conditions, an equilibrium will be established between the climate of a place and the cover of vegetation that protects the soil layer. Vegetation, trees and forests retard the transportation of soil material and act as a check against excessive erosion. A certain amount of erosion, however, does take place even under this natural cover; but it is such a slow process that it happens at the rate at which soil formation takes place. Such erosion is called geological erosion and proceeds in a natural undisturbed environment. As opposed to this we have what is called accelerated erosion. When vegetation is removed and land put under cultivation the natural balance existing between the soil, its vegetational cover and climate is disturbed. The removal of the surface soil takes place at a much faster rate than it can ever be built up by the soil forming processes. Erosion is thus accelerated. When dealing with erosion on cultivated soils we are considering only this accelerated erosion.

The damage due to wind and water erosion assumes different degrees of importance depending on the locality. Whenever soils without a cover of vegetation in a dry state are exposed to high winds, we have wind erosion. The fine portions of the soil are lifted and carried to great distances. In India as a whole wind erosion is not as extensive as water erosion. Light soils are more susceptible to wind erosion than heavy soils. Along rivers like the Hagari and the Pennar in the black soil areas sand blowings are common. During summer, when the river is dry, high south west monsoon winds lift up the sand which is deposited on the black soils making them unfit for cultivation in the course of some years. If this is allowed to go on without hindrance much of the cultivable land will get covered up with sand annually.

The following remarks are mostly confined to the effects of water erosion which is the more serious and extensive type of erosion that occurs in the black soil areas of the Ceded Districts Two fundamental types of water erosion are the 'gullying' and the 'sheet erosion'. In the case of sheet erosion, movement of run-off water and eroded soil takes place in sheets, approximately the same amount of soil being removed from each place. When this moving mass assumes sufficient velocity it has a cutting

action on the soil. A gully or a trench, as it were, forms at any small dent or depression in the field where this moving mass of soil and water collect at a high speed. The run-off water carrying the surface soil flows down the gully with ever increasing velocity. If the velocity of the run-off water is doubled its energy is increased four times and its cutting action is correspondingly increased ; its capacity to carry in suspension the soil material is increased sixty-four times The gullies tend to deepen and widen with every rainfall. They cut up agricultural lands into small fragments and make them unfit for cultivation in course of time. Of these two types of erosion, gullying is the more spectacular type while sheet erosion is the more insidious type, creeping on unnoticed. The destructive action due to sheet erosion may not be felt in the first few years. Only when, due to continuous erosion, the productive capacity of the land is diminished, we begin to realise that the fertility of the soil is being steadily lost. Sheet erosion usually ends in gully erosion. (Vide Fig. 1).

Let us now examine the chief causes of accelerated erosion in black soils. Run-off water and its speed on these soils are controlled by the following factors :

(1) the heavy nature of the soil and its physical condition ;
(2) the nature and distribution of rainfall ; and
(3) the slope of the country.

The black cotton soil or the *Regur* of the Madras Deccan is noted for its high clay content consisting of about 50 percent clay and 30 percent silt, the finest mechanical fractions of the soil. It is the fine colloidal clay that determines all the soil-water relations. It is highly retentive of moisture but on account of the heavy nature, the soil is slow to absorb rainwater. It is sticky when wet and hard when dry. These black soils have been shown by many workers to possess properties similar in many respects to the extensive group of black earths known as 'chernozems', one important difference being, however, that the chernozems are rich in organic matter while these soils are poor, consisting of only one to two per cent of organic matter. What happens when a heavy rain falls on these clayey soils? The colloidal clay which might be visualised as a thin film existing round the mineral particles swells on wetting. Clay in the flocculated state assists in the formation of compound particles. This aggregation into compound particles known as 'crumb structure' is agronomically the most desirable structure. It offers the least resistance to the passage of implements ; allows water to percolate better to the lower layers. But when rain drops begin to beat on these crumbs or compound particles, apart from the mechanical action of pulverising, deflocculation of the colloids sets in due to the washing away or leaching of the electrolytes ; the crumbs deteriorate and the soil-water mixture flows on the surface as a viscous fluid. Consequent on the loss of structure the fine material flows into the pore spaces in the soil, clogging them and preventing any further percolation of rain water to the lower layers. Absorption is then limited to the rate at which percolation to lower layers can take place, which, however, is very slow. Thus

the soil will not be able to absorb rain water as fast as it is received. The result is run-off.

The run-off carries away the surface soil with it. The amount of the run-off necessarily depends upon the intensity of rainfall. A heavy storm within a short interval might cause as much damage as all the other rains put together during the year. One of the factors conducive to excessive erosion in these soils is that there is no crop or other vegetation on the land during most of the period when the rains are received. The main *hingari* crops, cotton and sorghum, are harvested by March or April; between April and September or October, until the next sowings are done, the land is fallow. The distribution of rainfall is such that out of an annual precipitation of about 20 in. about 12 in. are received in the quarter—August, September and October. It is only after the September rains are received that cotton is sown, sorghum being sown in October. Most of the rainfall is thus received only when the land is fallow. A few *mungari* or early crops like *korra* (Italian millet) and groundnut, if sown, are all the protection that the soil has against erosion consequent on the direct impact of rain. It is not also uncommon to receive a downpour of about 3 in. overnight. One or two such instalments of intensive rainfall occur every year. Added to these the land is slopy in nature. Thus the heavy type of soil, which does not allow rain water to be absorbed as fast as it is received, the undulating nature of the land and the fact that soil is exposed without any protective cover for most of the rainy period are the chief factors underlying accelerated erosion in black soils.

Losses of soil and water due to erosion can be measured accurately. A knowledge of this aspect of the problem is essential for an understanding of the magnitude of the losses. During the last five years soil and water losses due to run-off were studied at the Dry Farming Station, Hagari. Two plots 66 ft. by 8$\frac{1}{4}$ ft. (area 1·25 cents) with a gradient of 1 in 80 were selected. On three sides the plots were enclosed by galvanised iron sheets, which project about a foot above the ground level. The run-off was collected in masonry cisterns (6 ft. × 4 ft. × 3 ft.) towards which the plots slope (Fig. 2). The volume of the mixture of soil and water that collected in the cisterns after each rain was measured. Samples of run-off waters were analysed for water and soil separately, from which the amount of water collecting in the cisterns by run-off and the amount of soil that it carries with it are calculated. The samples were also analysed for total salts, lime and nitrate nitrogen.

During 1937–38 both the plots served as duplicates, only hand-hoeing being done before the rainy season in both.

Any method by which the velocity of flow of the run-off waters could be minimised helps in reducing erosion. If small pockets or basins are formed, it will be an effective check against excessive erosion. The effect of 'scooping' on the control of erosion was investigated during 1938–39 and 1939–40. One of the plots had scoops formed in it before the rainy

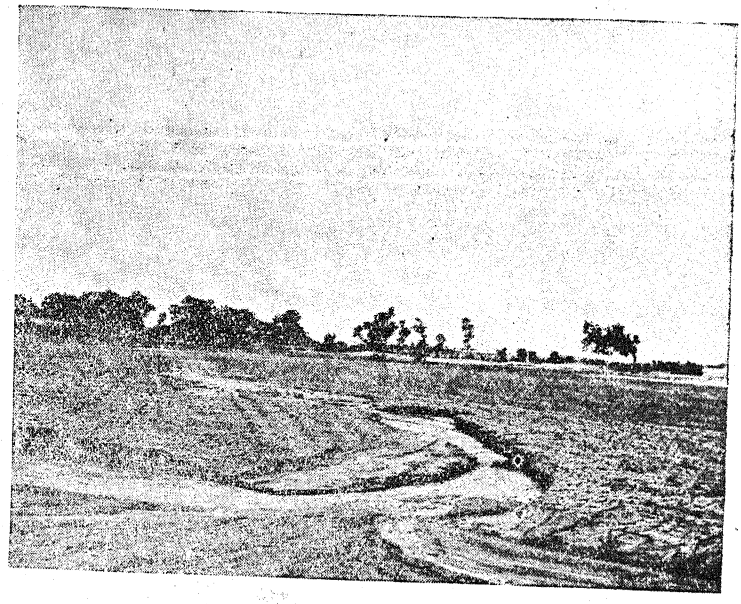


Fig. 1. Gullying in black soils.

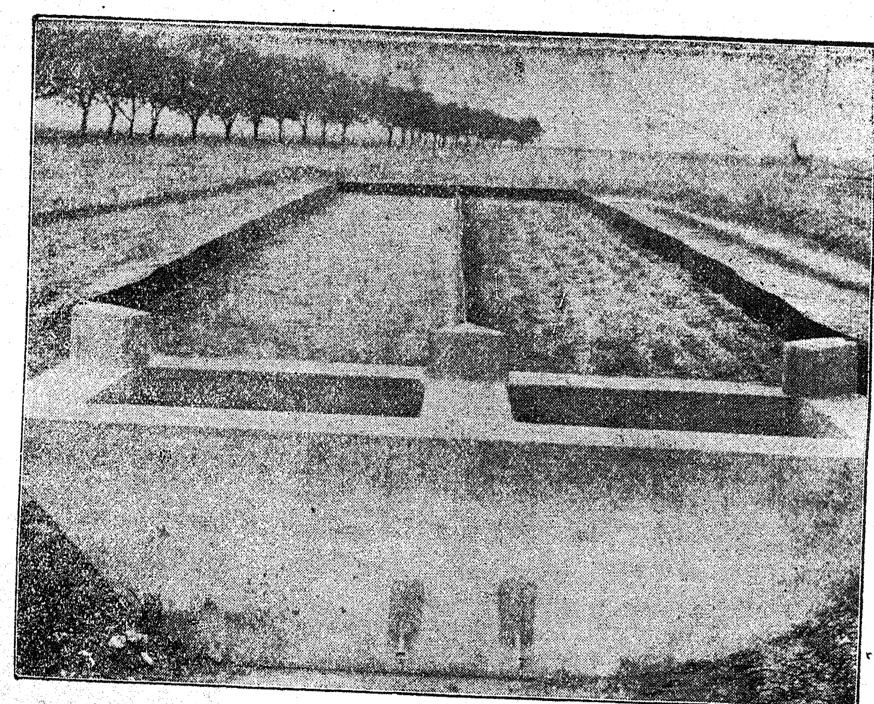


Fig 2. Run-off plots at Hagari—control and scooped plots.

season, while the other was given hand-hoeing and kept as clean fallow. The latter served as control. The results obtained during the years 1937 to 1940 are given in the following table.

TABLE 1. **Run-off results, 1937 – 40**

	1937–38 Average of two control plots	1938–39		1939–40*	
		Control	Scooped	Control	Scooped
1. Number of days when there was run-off	11	13	10	16	10
2. Total rainfall on days when there was run-off in either of the plots–inches	9·16	15·66	15·66	8·36	8·36
3. Rain water lost–inches	4·00	7·52	3·29	2·73	1·34
4. Rain water lost—expressed as per cent of rainfall received	43·67	48·01	21·01	32·66	16·03
5. Silt washed off in tons per acre	6·58	9·86	3·60	7·35	2·44
6. Silt washed off in tons per acre per inch of rain water lost	1·65	1·31	1·09	2·69	1·82
7. Total salts lost in lb. per acre	100·60	132·86	95·79	65·00	41·72
8. Lime (CaO) lost in lb. per acre	2·45	20·07	16·79	5·46	2·62
9. Nitric nitrogen lost in lb. per acre	0·11	0·59	0·29	0·19	0·09

* Excluding data on two days when the run-off cisterns overflowed—rainfall being 3·82 in. and 2·61 in. within 24 hours on 10th August 1939 and 25th October 1939 respectively.

It is seen from these figures that in the control plot 44 and 48 per cent of the rainfall was lost by surface run-off during 1937 and 1938. Considerable amounts of silt were lost in the run-off waters. The soil losses amounted to 6·6, 9·9, and 7·4 tons per acre for a rainfall of 9·2 in , 15·7 in. and 8·4 in. respectively. Every inch of run-off water carried away 1·5 tons of silt per acre during 1937 and 1938. It was even more during 1939.

While the actual amount of run-off depends on the intensity of the rainfall and the slope of the plots, some of the American results reported from the Texas Experimental Station on run-off under agricultural conditions were 3 tons per acre per inch of rainwater lost. Grass was found to be 65 times more efficient in the control of soil losses and five times more effective in checking water losses than bare soil.

At the Sholapur Dry Farming Station, it was found that a clean fallow plot lost 25 tons of soil in one year for a rainfall of 14·8 in. when the run-off was only 5·8 in. The soil removed per inch of rainwater lost was 4·3 tons per acre under the same conditions of gradient and size of plot as at Hagari, while the corresponding figures for Hagari were 1·6 tons per acre during 1937 and 1·3 tons per acre during 1938. A plot in which weeds

were preserved gave only 0·58 tons per acre or 1/50th of the losses in the clean fallow plot at Sholapur.

On an average, excluding days of very heavy rainfall as occurred in 1939, about 8 tons of soil per acre was lost by erosion in a clean fallow plot at Hagari, *i. e.*, about 16 cart-loads of fine silt.

Intense storms contribute most to run-off. A single storm on the 28/29th of September, 1938, for example, was responsible for nearly a third of the total loss of silt and a fourth of the total loss of water that occurred during the whole year.

	Rainfall, in inches.	Water loss in inches.	Soil loss in tons per acre.
28/29—9—1938	3·57	1·81	3·29
Whole rainy period of 1938	15·66	7·52	9·86

Such instances are very common when the scouring action of an intense downpour does great harm and removes much of the valuable surface soil.

When the soil is very dry and numerous cracks are present, even a heavy precipitation does not give much run-off. Run-offs recorded early in the season are very small; (e. g.) on 4th July 1939 for a rainfall of 1·14 in. the run-off was only 0·03 in. and the soil loss was 0·03 tons per acre. Run-off data recorded early in 1940—41, illustrating this point is given below.

Run-off data recorded early in 1940—41

Date	Rainfall in inches	Run-off in inches
7—6—40	0·49	0·10
10—6—40	0·52	0·26
13—8—40	0·97	0·02
13—9—40	0·87	0·04
Total.	2·85	0·42

Effect of scooping on the control of erosion It is seen from Table 1, that by scooping or listing the water losses are reduced from 7·5 to 3·3 in. and from 2·7 to 1·3 in. respectively for the years 1938-39 and 1939-40, while the soil losses for the same period were reduced from 9·9 to 3·6 tons per acre and from 7·4 to 2·4 tons per acre respectively. Scooping the land therefore considerably reduced the run-off and consequent losses by erosion. Data on a few occasions when the scoops were very effective in reducing run-off is given below.

TABLE 2. **Extract of run-off data for 1938**

Date.	Rainfall, in inches	Run-off in inches		Silt lost in tons/acre	
		Control	Scooped	Control	Scooped
6—8—38	1·89	1·12	0·26	1·259	0·409
18—8—38	1·62	0·92	0·15	1·020	0·185
22—8—38	2·39	1·31	0·71	1·570	0·842
24—9—38	1·18	0·60	0·03	0·492	0·036
25—9—38	0·81	0·39	0·09	0·215	0·032
Total	7·89	4·34	1·24	4·556	1·504

The reduction in the run-off in the scooped plot on these occasions of heavy rainfall is due to the mechanical obstruction to the flow of water which the scoops offer.

The total salts washed off the surface are not considerable; the weight of the top 6 in. layer of soil will be about 1000 tons per acre and 100 lb. in this is negligible.

Quality of the soil washed by the run-off waters The soil collected in the run-off cisterns was analysed for the physical and chemical composition. The results are given in the following table.

TABLE 3. Mechanical analysis of silt collected in 1937-38

Heads of analysis	Run-off silt	Soil 0 to 1 ft. layer
Clay (per cent)	56·8	44·9
Silt (,,)	26·9	17·1
Fine sand (,,)	8·5	15·7
Course sand (,,)	1·4	17·5

TABLE 4. Chemical analysis of silt collected in 1937-38

Heads of analysis	Run-off silt	Soil 0 to 1 ft. layer
Loss on ignition	7·14	3·12
Insoluble matter	63·95	75·49
Iron and alumina (Fe_2O_3, Al_2O_3)	20·95	13·19
Lime (CaO)	3·83	3·45
Magnesia (MgO)	1·52	0·92
Potash (K_2O)	1·28	0·29
Phosphoric acid (P_2O_5)	0·041	0·054
Nitrogen (N)	0·043	0·024

These figures for the analysis of silts collected in the run-off cisterns are typical of the data obtained year after year. The analysis of the soil from the top one foot layer is also given in the tables for purposes of comparison. The figures for the mechanical analysis show that the silt washed off the land consists of about 84 per cent of the fine fractions, clay and silt, while the original soil contains only 62 per cent. The difference is due to the fact that during the course of the washes the coarse particles settle out quickly and it is the fine material that gets lost The nitrogen content of the silt was 0·043 per cent while that of the soil was only 0·024 per cent. Potash in the silt was about four times that contained in the soil. Thus from all accounts the silt that is washed off the land is much richer than the original soil Much of the organic matter present in the surface soil gets lost; the loss on ignition for the silt being nearly double that for the original soil. The fertility of the soil is lost. A poorer soil is left behind. A healthy soil is the first essential for the production of a healthy crop. Loss in soil fertility results in a crop which is unhealthy and susceptible to disease.

Effect of a cover crop on the control of erosion During 1940-41 and 1941–42, the effect of a cover crop of groundnut on the control of erosion was studied in the above plots. Groundnut (A H. 25), spreading variety, was sown in one of the plots early in June and it was harvested early in December. If timely rains are received for the sowing of a *mungari* crop like groundnut, it will be on the field practically throughout the rainy period and will be a good protection against erosion.

Table 5. Results of run-off for 1940–41

(Data from 13–6–40 to 13–12–40, the date of sowing and harvest of groundnut respectively, in one of the plots)

	Control clean fallow	Cropped with groundnut
1. Number of days when there was run-off	11	5
2. Total rainfall on days when there was run-off in either of the plots in inches	7·63	7·63
3. Rain water lost in inches	2·81	1·63
4. Silt washed off in tons per acre	1·83	0·98
5. Total salts in lb. per acre	102·61	62·48
6. Lime (CaO) lost in lb. per acre	19·12	7·93

The number of days when there was run-off was 11 in the clean fallow plot while it was only 5 in the cropped plot. Losses of water and soil are also reduced by nearly 50 per cent in the plot with the cover crop of groundnut. The effect of the cover crop in the reduction of the run-off is threefold: *viz.* (1) interception of the rainfall by the crop reduces the intensity of the rain drops reaching the soil; (2) the spread of the crop offers mechanical obstruction to the flow of water; and (3) absorption of moisture by the crop reduces the cropped plot to a drier state than the uncropped one and the soil will readily absorb the rain water when in a dry state. This will tend to lessen run-off. For these reasons losses of soil and water by surface run-off, in the plot with the cover crop of groundnut were reduced to nearly half those occurring in the control plot. As stated earlier, most of the rainfall is received in the period August to October, during the period when the *mungari* crops, if any are sown, are on the field. It will therefore be advantageous to have strips or belts of a *mungari* crop across the slopes during the rainy period, in areas which are subject to severe erosion.

Soil conservation measures The main principle underlying methods of control of erosion is to reduce the velocity of the flowing water If the velocity is reduced its amount naturally gets reduced. Methods of control of erosion may be either mechanical or biological. Bunding, listing or scooping and damming are the purely mechanical methods of control of erosion. The flow of run-off water is checked and greater time allowed for it to soak into the land. In cultural operations like ploughing the soil is brought into good physical condition for absorption. Ploughing on slopy land should never be done along the slopes as the furrows will form

channels of drainage and run-off will be increased. On the other hand ploughing across the slopes greatly adds to the capacity of the soil to absorb rain water.

If all the rain water gets into the land there is neither run-off nor erosion. But this is impossible and we can try by various measures to minimise erosion. We have seen how scooping reduces losses due to erosion considerably. Bunding, as advocated by the Department of Agriculture, is a very simple operation and rain water is held well in the compartments. The "bundformer" which forms bunds about 7 in. high can cover about 10 acres a day, the cost of working being only about four annas per acre. Being an annual operation, it should become part of the preparatory cultivation like the working of the *Guntaka* or the blade harrow.

Bunding as advocated in the Bombay Presidency differs from the system of bunds formed by the "bundformer". They are high bunds, about 2 to 3 feet in height and provided with waste weirs for the flow of surplus water. They are more or less permanent improvements which will be of greater use in very slopy fields. In such fields contour cultivation offers one of the best means of controlling erosion.

Among the biological methods of control of erosion, cultivation of crops should be done in such a way that the maximum protection to the soil is offered for as long a period as possible, during the rainy season. Strip cropping is one of the best examples among the methods of biological control of agricultural erosion. Wide-spaced, clean-tilled crops like cotton offer the least resistance to erosion, while close-growing crops like *korra* or groundnut offer the maximum resistance to erosion. The principle of strip cropping is to alternate strips of erosion-permitting with erosion-resisting crops. Under the local conditions of Hagari, mixtures of *korra* and cotton are sown in the *mungari* season. These can easily be replaced by strips of *korra* and strips of cotton. Not only is this anti-erosive; but it was found that there was minimum of root competition in such an arrangement. Strips of *korra* alternated with strips of groundnut also form an efficient cover against erosion.

I have attempted to place before you the main factors which contribute to excessive erosion in black soils and the magnitude of the soil and water losses that occur due to surface run-off. One example of mechanical method of control of erosion (scooping) and one example of biological method of control of erosion (cover crop of groundnut) were studied in detail as to their effects on the reduction of run-off. The necessity for obtaining such data under different agronomic practices and under different soil and climatic conditions is obvious. Only a beginning has been made in the study of erosion losses. Conservation of moisture in dry areas should necessarily aim at minimising run-off. A more efficient use should be made of the rain water, by making as much of it as possible get into the soil. This aspect of the problem will be dealt with in the next lecture.

A New Millet—*Brachiaria ramosa* Stapf

By K. CHERIAN JACOB, L. Ag., F. L. S.

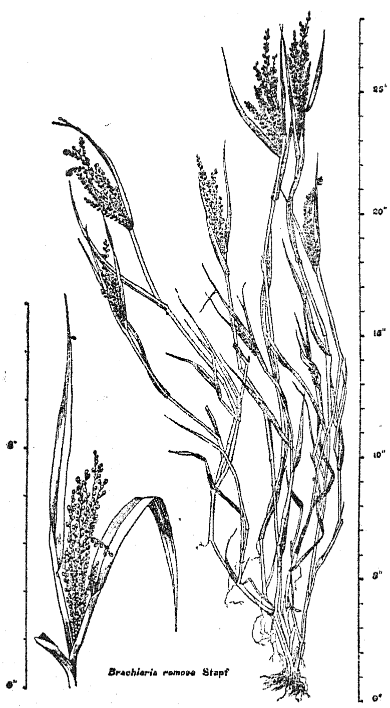
Agricultural Research Institute, Coimbatore

Some common grasses found in the Madras Province enumerated below are recorded to be under cultivation in parts of Northern India for grain which is used as human food. The more important among these are :— (1) *Echinochloa colona* Link. (*Panicum colonum* Linn.), Kan : *Gadde votapagante hullu ;* Tel : *Otha gaddi, Kaproda gaddi* ; Tam : *Karum pul, Varsanum pullu* It is cultivated in the Montgomery district of the Punjab and the grain is made into a paste, called '*bat*', and eaten with milk. (2) *Echinochloa crus-galli* Beauv (*Panicum Crus-galli* L.), Kan : *Kadu dabhai hullu;* Tel : *Pedda wundu ;* Tam : *Oothu pul.* It is cultivated in parts of the Lahore district for its grain which is made into *Khir* and eaten. (3) *Urochloa reptans* Stapf (*Panicum prostratum* Lamk.), Kan : *Kavadaga hullu;* Tam : *Shani pullu, Muzinkam pul.* The grain is collected and used as food in times of scarcity (4) *Paspalidium flavidum* A. Camus. (*Panicum flavidum* Retz.), Tel : *Uda gaddi* ; Tam : *Arisi pul.* It is regularly grown in certain districts of the Bombay Province The grain will keep many years without being attacked by insects. (5) *Setaria pallidefusca* Stapf et Hubb. (*Setaria glauca* Beauv.), Eng : Pigeon or Bottle grass ; Kan : *Korane hullu ;* Tel : *Nakka korra, Nariga, Koranike ;* Tam : *Korali.* It is cultivated in some parts of the Nilgiris. In parts of the Central Provinces and Chota Nagpur the grain of the wild plant is collected, while in parts of the Bombay Province the grain of the cultivated variety is used as food.

Brachiaria ramosa Stapf (*Panicum ramosum* Linn.), Kan : *Bennai akki hullu, Kadu baragu hullu ;* Tel : *Anda korra, Disakalu, Eduri gaddi ;* Tam : *Pala pul, Kamban pul ;* Mal : *Chama pothaval.* It is a grass found throughout the Madras Province which recently attracted the writer's attention as being grown in some parts of the province for its grain. It does not find mention in any standard publication as being cultivated anywhere for its grain even though it is an erect grass and more robust than some of the grain-yielding grasses enumerated above. This omission is probably due to its Telugu name *Anda korra* by virtue of which it is usually regarded as a variety of *korra* (*Setaria italica* Beauv.)—the Italian millet. Moreover, it is included in the revenue records under *korra.* It is, however, botanically very different from *korra* as the following description shows :—

Description It is an annual or often perennial grass commonly met with in cultivated lands. Stem 1 – 3 ft. high, erect or ascending from a shortly creeping base and rooting from the basal nodes, slender or rather stout, much branched from the base upwards, usually glabrous, leafy ; nodes pubescent. Leaves 2—5 by $\frac{1}{6}$ $\frac{1}{2}$ in, linear-lanceolate, finely acuminate, thin, flat, smooth, glabrous or pubescent beneath, with scaberulous margin, base rounded ; sheaths glabrous or pubescent, ciliate towards the mouth ;

ligule a fringe of short hairs. Panicle 2—6 in. long, subpyramidal, with a long peduncle in the wild forms and short ones in the cultivated forms; rhachis angular; branches of panicle 5—6, distant in wild forms and very close in cultivated forms, 1—2 in. long, alternate, erect or spreading, shorter upwards; rhachis of racemes slender, angular, puberulous. Spikelets alternate, $\frac{1}{10}$—$\frac{1}{8}$ in. long, close or distant, often in pairs (a sessile and a pedicellate one), ovoid, acute, glabrous, turgid, pale green or yellowish; pedicels with a few long hairs near the tip. Glumes 4; lower involucral-glume half as long as the lower floral glume, ovate, acute, hyaline; upper involucral-glume about equalling the lower floral glume, ovate, acute, cuspidate, 5-nerved; lower floral glume similar but slightly broader, with membranous palea, empty; upper floral glume coriaceous, ovoid-oblong, acute, rugulose, with coriaceous palea.



The New Millet.

The panicles in the cultivated forms are very much branched though in some of the wild forms they may consist of only three or four spikes. The spikelets in a spike are more numerous in the cultivated forms.

Specimens of this grass were received from the Agricultural Demonstrators, Vizagapatam and Madakasira, for identification. The following details were furnished by them.

Area About 8,000 acres in Madakasira taluk, Anantapur district, 2,000 acres in the Madhugiri taluk of the Tumkur District of the Mysore State and 5 acres at Nellure village near Vizagapatam town are known to be under this crop. Madhugiri and Madakasira are 2,000 feet above sea-level. The soil is a red loam.

Season of cultivation It is a crop of very short duration, being ready for harvest in three months. It is sown at any time between the latter half of August and the middle of October and is usually harvested before the end of December.

Yield This varies with the situation in which the crop is grown. In places with a fair and well-distributed rainfall, yields as high as 500 lb. are obtained but in drier situations the yield is about 300 lb. The average may be taken as 400 lb. per acre. The yield of straw is about 500 pounds per acre; it is relished by cattle.

Preparation of grain The grain is husked and the glumes are removed just as in the case of the Italian millet. The ratio of pounded grain to whole grain is 3:8 by volume and 40 per cent by weight. The husked grain is mixed with *ragi* (*Eleusine coracana* Gaertn.) flour and made into a pudding commonly known as *kali* in Tamil. Very rarely it is made into *rotties* (cakes). This grain is considered superior to *Panicum miliare* Lamk. (Tam. *samai*). Many *ryots* use this grain during certain months of the year.

Acknowledgment My thanks are due to Sri M. Vaidyanathan, Agricultural Demonstrator, Madakasira taluk, Anantapur district, for the information supplied by him.

References

Cooke, T. (1908) *Flora of the Presidency of Bombay*, 932—33.
Fischer, C. E. C. (1934) *Flora of the Presidency of Madras*, Part 10.
George Watt. (1892) *Dictionary of the Economic Products of India*, 6, 7—14.
Jacob, K. Cherian (1939) *Madras Agricultural Journal*, **27**, 9—18.
Jacob, K. Cherian (1942) *Madras Agricultural Journal*, **30**, 179—91.

Economic Entomologists and Scientific Names of Insects*

By Dr. T. V. R. Ayyar, Ph. D.

It is not uncommon nowadays to find workers in the economic aspects of zoology, especially Economic Entomologists, finding themselves in very awkward situations when they attempt to call by scientific names some of those organisms with which they have to deal. While the field entomologist is quite sure of the identity and the various features and idiosyncrasies of the beetle, bug, grasshopper or moth he has been dealing with, perhaps for many years, the scientific apellations of those insects get frequently changed at the hands of our systematists. It has of course to be admitted that every one dealing with an insect, or for the matter of that, any organism, has necessarily to know the which particular creature it is that he is dealing with and its correct identity; but having assured himself of the latter by continuous touch with it for years, it becomes rather funny, if not annoying, to find that the name once given to a creature is in some cases frequently changed. Fernald was quite right when he said that "the work of dealing with the constantly changing scientific names is indeed a difficult problem". Most of us know that the names of some of our common insects have been changing from time to time from one to another and in some cases reverting to the same old name which were rejected some time back! Numerous examples could be pointed out of such nomenclatural acrobatics connected with insects. It is felt rather funny when we find the name of our old friend, the common fruit fly-'*Dacus*', changed to '*Chaetodacus*' and then again to find that in course of time he is '*Dacus*' again. The castor semilooper which was at first '*Achaea*' became '*Ophiusa*' and has again been labelled

* Paper read at the Indian Science Congress, Baroda, 1942.

'*Achaea*'! Similarly with numerous specific names of common insects we can point out such funny changes. For example '*Crambus zonellus*' became '*Chilo simplex*' and there was a sudden permutation and combination and the creature became '*Chilo zonellus*'. '*Chloridea armigera*' became '*C. obsoleta*', changed to '*Heliothis obsoleta*' and then again put on the coat of '*Heloithis armigera*'! The nomenclatural thunderstorms and cataclysms through which our friend the rice stem-borer, at present labelled '*Schoenobius incertellus*', has passed have been unique, the insect having passed through not less than twenty or twenty five *aliases!* In the words of Fletcher, "this is one of those unfortunate insects to which so many names have been applied that it is difficult without extensive incursions into literature to ascertain its correct synonymy; within two years after its discovery the insect received no less than six names. God knows whether that poor creature inside the rice stem may not perhaps, have to answer to a different name in the near future." A good deal of confusion in that way has also been created with the names of the borers of sugar-cane and millets, and we cannot be quite sure whether our systematists have as yet come to any definite conclusions as regards the names of these important economic forms. The minute groundnut leaf miner is another victim who has suffered from numerous fresh christenings. It may also be added that often in connection with these ever-changing apellations we are liable to be hauled up for some minor crimes in nomenclatural practice; when you use a scientific name and you omit the author's name with it you are caught; you must not add a comma between the name of the insect and that of the priest who baptized it. Again if you use the abbreviated form of the author's name by using the initial letter or letters of his name as has been done for decades, you are guilty, since recent regulations require that you must use only approved abbreviations. While the writer of this paper knows that he has managed to describe and baptize a few insects and get published a few papers in standard publications without such rigorous restrictions, he has not so far become aware as to what the approved abbreviation is for his name for use in later references! It might at the same time be added that these codes, restrictions and strict rules have not been followed even in some well known books and publications. We are all aware that there are standard works in Entomology where scientific names are used without the author's name. In Lefroy's *Indian Insect Life*, Imm's *Text Book of Entomology*, and in some of the old Reports of our Imperial Entomologist and good many other instances, we do not find such restrictions and systematic dogmas closely followed; and yet those publications continue to be valuable and have not received any black mark or dissatisfaction from any quarters. A very recent publication has appeared on "Indian Forest Insects" by Beeson where too the numerous insects noted stand quite naked without the author's flag.

In placing these facts and observations before you I may add that I am not at all finding fault with the systematists or their ways, since they must

certainly have proper and sufficient reasons for these regulations, frequent changes and codifications. What I plead is that non-systematists who cannot be expected to be in close touch with this subject often suffer from those constant changes in the names of some common and well known insects. It may be emphasised and the fact cannot but be admitted that classification or taxonomy after all is not an end in itself, but only a means to an end and it is therefore highly necessary that there should be some limitations placed on this oft-occurring acrobatics in nomenclature. This was what Lefroy wrote thirty years ago—"It is easy to learn about *Acridium succintum* (this insect too has changed its name, the present one being *Patanga succinta*), as much as it is about the Bombay locust. Persons who see an insect in the field and know that it is *Pentadactylorthopteriodes vigintioctonigropunctulomaculata* N. are often apt to forget whether it is a grasshopper or a bee, or whether it is injurious or not. No good is done by hurling scientific names at an insect in the field. It is far more important to be able to recognise a cock-chaffer, to know that its grub lives in the ground, and eats roots, and to know that if one is found others are likely to be there and should be destroyed before they lay eggs." Though I would certainly not go to the extent of endorsing all these funny remarks of Lefroy, since it is highly essential to know exactly which particular creature we are dealing with, what one often feels is that these nomenclatural changes unfortunately produce a lot of confusion and we, Economic Entomologists, have to find a way to steer clear of these constant and, perhaps, inevitable changes and make our progress smooth in this direction.

It is, perhaps known to good many of you that the American Association of Economic Entomologists has tried to work out a method to overcome this nomenclatural difficulty by preparing sets of popular names for all well-known insects and get these sets approved for use among Economic Entomologisis. Periodically a set of names is prepared and sent up by different workers for approval to a committee which finally approves or modifies these names and the approved ones are added to the permanent list of common popular names. Thus when any author uses, say a name like 'Fluted scale' in a particular paper or report, any one in the field of Entomology knows he is referring to *Icerya purchasi* whatever mutations and combinations are made in the future by our species-makers with its scientific name. I would invite the kind attention of friends who are anxious to know something about this subject to the pages of the *Journal of Economic Entomology (America) Vols. XXIV* and *XXVI*. I am wondering whether it is not time for us in India to do some such thing and save ourselves from the constant pricks and disturbances from our systematist friends. I may perhaps be wrong in my ideas and remarks, and that is the very reason for submitting my views to you to get your valuable criticisms and suggestions on this subject of nomenclatural acrobatics in systematic entomology.

As a sample I might here add a small list of a few of the many popular names with which most of our Agricultural Entomologists are familiar and

know which these insects are however frequently their scientific apellations change.

Popular Name.	*Present Scientific Name.*
The rice swarming caterpillar ...	Spodoptera mauritia
Rice stem-borer	Schoenobius incertellus
Rice Hispa	Hispa armigera
Rice bug	Leptocorisa acuta
Rice grasshopper	Hieroglyphus banian
Rice case worm	Nymphula depunctalis
Rice gall fly	Pachydiplosis oryzae
Deccan grass-hopper	Colemania sphenarioides
Behar Hairy Caterpillar	Diacrisia obliqua
Cane top shoot borer	Scirpophaga nivella
Cane leaf hopper	Pyrilla perpusilla
Castor semilooper	Achoea janata
Capsule borer	Dichocrocis punctiferalis
Pink bollworm of cotton	Platyedra gossypiella
Cotton leaf roller	Sylepta derogata
Red cotton bug	Dysdercus cingulatus
Dusky cotton bug	Oxycaraenus latus
Sweet potato weevil	Cylas formicarius
Diamond back moth	Plutella maculi-pennis
Mustard saw fly	Athalia proxima
Anar butter fly	Virachola isocrates
Rhinocerus beetle	Oryctes rhinocerus

SELECTED ARTICLE

Compost and its Fertilising Value

The 'Grow More Food' campaign has of late engaged the serious attention of the public. The cessation of import of rice and wheat coupled with the increase in demand of food stuffs for the army has precipitated a food shortage in our country. The difficulty has been further increased by the fall in production of the food crop and restriction of transport. These difficulties were discussed in a recent Food Drive Conference held at Delhi under the presidency of Hon'ble Mr. N R. Sarker who drew a food crop map of India and stressed the need of making each province self-sufficient in food crops.

The problem of growing more food now is essentially one of increasing the fertility of the soil. Recently in a 'Grow More Food' meeting held at the Calcutta University Institute Dr. C. R. Harler read a paper on Compost and in a similar meeting at Firpo's Restaurant Mr E. F. Watson spoke on Compost. The following note is adapted from their papers.

Meaning of the fertile soil At the very outset we should have a clear idea as to what we mean by a fertile soil that will grow a healthy plant to its fullest development. In plant kingdom the word 'healthy' does not simply imply 'free from disease', it means an inherent power on the part of the plant to resist disease. For a long time we have been taught to value our soils on the amounts of nitrogen, phosphorus and pottassium salts present in them. As is generally indicated soil is not a dead inorganic matter, but it is a vast store house of living organisms on whose activity our agriculture largely depends. There is one particular group of microscopic fungi, the micorhiza, living in combination with the roots of plants and eventually absorbed into their tissues, that transcends all

others in importance since it appears to be the living bridge by which alone powers of resisting diseases enter into the plant. The importance of the chemicals we have mentioned lies in the fact they are necessary in the food supply of all soil organisms—the material known as 'humus', a complex product formed after the decay of organic matter. It is particularly the presence of humus which determines the fertility of the soil and we will subsequently notice that the main purpose of processing the soil, or what is better known as composting, is to increase the humus in the soil.

Composting an old process It is not that our cultivators do not realise the importance of preparing the soil before sowing. The cultivator has a tradition of thousand years and has a knowledge of soil almost by intuition. It is a common practice among the *ryots* to allow roots of previous crops, weeds and some surface algae growth to rot and decompose in the soil. Even the practice of composting is known to have existed among the cultivators centuries ago. The Chinese cultivators particularly used to feed their soil with compost—which explains why the Chinese can keep their soil constantly under cultivation. But the early method of composting was however, crude and wasteful. It is only recently that composting has been studied systematically and scientifically with the development of the most useful methods One of the pioneers in this study is Sir Albert Howard, well known in India for his work on Pusa wheat and cotton in Indore. At Indore he studied the composting of sugar-cane trash and devised a method known as the (Indore process). Today the great value of compost need hardly be overestimated. Its contribution to the soil productivity is widely recognised though it has not yet attracted popularity among the cultivators. It will be the purpose of the following paragraphs to discuss the process involved in composting in some detail.

Essentials for Composting Compost is commonly a decomposed mixture of cowdung and vegetable matter like leaves, twigs, weeds, etc. The mixture is generally allowed to rot and decompose before it is buried in the soil as a black mould, resembling soil humus. It is also known that vegetable matters directly buried into the soil also decompose and subsequently turn into soil humus. Naturally the necessity of composting may be called into question. The reason is not far to seek Vegetable matter is turned to soil humus by bacteria which exist both in the soil and in cowdung. If we let the soil bacteria do the work the crop which depends for its growth upon the action of soil bacteria suffers. Hence it is preferable to break down the vegetable matter outside the soil and add it after it has been converted to humus.

There are five essentials for composting. They are ;— (1) organic matter and soiled stable bedding, (2) Cattle manure, (3) urine earth, (4) ashes, and (5) water. Organic matter forms the bulk of the compost of which there must be plenty of leaves, twigs, stems and rough stuff. It is waste of time to compost leaves and fine weeds alone, for these very soon form humus if buried straight into the soil. The value of composting is that rough stuff can be broken down.

Cattle manure, however, is another essential requirement. Each night the average cow voids about 10 lb. dung or $1\frac{3}{4}$ tons in a year. This is enough to produce 10 tons compost a year sufficient to dose half an acre of land.

Urine earth, as the very name implies, is earth soaked in urine. It is made by covering the floor of the cattle shed with tramped down earth to a depth of about 9 inches. When a compost pit is being charged, a patch of this urine soaked earth is dug up and replaced with fresh earth. Compost cannot be made without urine which is very rich in potash.

Wood ashes are important for composting owing to their potash and phosphate contents. Besides being valuable plant foods, potash and phosphates,

owing to their alkaline properties, are necessary to reduce the acidity which is set up in the compost pit. In place of wood ashes lime may be used. The necessity of water, however, goes without saying.

A Practical Procedure The compost pit is generally 30 feet by 14 feet and 2 feet deep. One pit is needed for each five head of cattle if sufficient vegetable matter is available. A rough estimate of charge with the proportion of the various constituents will be useful. To charge the pit the following should be added in the given quantity :—

4 to 5 inches sun dried vegetable matter and soiled bedding	1,000 lb.
6 baskets urine earth	168 lb.
12 baskets wood ashes	36 lb.
12 baskets cowdung	300 lb.
Water (to be sprinkled)	60 to 100 gallons.

Partially dried green stuff is desirable, for fresh stuff tends to pack tightly and exclude air. The layers described above should be laid down each day for about six days and the whole thing is then left to decompose. The changes taking place resemble in some way those going on in the cow's stomach. The pit, in effect, turns green stuff into something resembling cow manure.

After 15 days from the start the contents of the pit should be turned over to fill half the pit. This process admits air into the mass. After about 30 days from the start the stuff is again turned back into the first half of the pit. In this way when about two months elapse the stuff is taken from the pit and heaped outside, and after three months the mass becomes black and crumbly, resembling well rotted cattle manure.

The temperature in the compost pit is important. During the breaking down process the pit heats up. After 21 days the temperature should be 130—140°F. The *ryot* will not have a thermometer, but once shown, he will be able to judge the heat for himself. After 60 days the temperature should be 100—110°F. If the temperature rises very high it indicates that the green stuff used is too fine, on the other hand, a small rise in temperature may be due to various reasons. In the first place it might be due to the poverty of urine in the urine soaked earth. It only depends upon the nature of the packing which should not be too tight or too loose and also on the heap which should be neither too wet nor too dry. Experience alone will beget skill in controlling these factors essential for preparing a successful compost. Further more preliminary experiments are sometimes necessary. If the directions given be faithfully followed there is every chance of success. Later on the cattle manure may be reduced or the green stuff increased, but if decomposition does not take place the experimental steps should be retracted.

Importance of Composting The Indore compost costs nothing but the labour. The dose should not be less than 20 tons per acre. The total fertilising value is difficult to assess for its effect is spread over a long period and works in diverse ways. It can be said that a dose of compost has more effect than an equal dose of cattle manure for it is richer in plant food. It is to be noted that after the use of compost there takes place a large increase in the earth-worm population. The earth-worm is the finest cultivator one can have. It works a 7 day week 24 hours a day bringing soil particles from below up to the surface and makes channels for air to reach the lower soil. Chemical manures are often a great danger. Not only do they kill the earth-worm population but they stimulate the plant to use up humus at an increased rate. They should therefore never be applied to soils that have not got a large reserve of humus. And to a soil that has plenty of humus they are quite unnecessary. Anyone who wishes to use

artificials should do so by adding them in small quantity to the compost heap and let them reach the plant that way.

The increase of outturn obtained using compost is by no means, the whole story. Crops grown in fertile soils are found to be so much more satisfying than a smaller quantity suffices both for man and beast. They have moreover the inestimable advantage of handing on to their consumers the disease resisting properties that the crops have themselves attained. One cannot expect to get a healthy people and a healthy live-stock unless their food is obtained from healthy crops grown on fertile soil.

In tropical countries difficulty of a serious nature is often met with when a forest area is cleared up and the tropical sun reaches the soil. The organic matter disappears there at an alarming rate. A few years after opening, a new soil may have lost half its original fertility which decreases to a low level at which it is naturally maintained. Most Indian soils have reached this last stage. The need of tropical soil is, therefore, protection from the sun and the addition of organic matter. The composting of waste vegetable matter, if it is available, will add greatly to the fertility of Indian soils and help us to produce more food. We should become 'compost minded', for this will give us respect and feeling for the soil.

Conclusion All over the world to-day the soil is being raped. In America the grass lands were ploughed up and put under wheat year after year so that the organic matter was used up and the soil lost cohesion and blew away. The 'dust bowl' is the result. In Australia a similar state has arisen, whilst in both continents the cutting down of forests has released the rain water in spates and washed away many areas of fine soil. Wind and water erosion are forming deserts. In Africa overgrazing has had similar results and the desert is advancing at the alarming rate of half a mile a year in some places. In India we see in all sides the harmful effects of deforestation, soil erosion, overgrazing and general soil mismanagement. If we add up the waste of capital that this state of affairs involves we find that the cost of the war amounts to a mere bagatele compared to the value of the inheritance we are dissipating daily. The Royal Agricultural Commission to India a few years ago and other many smaller commissions and committees have all put it down in black and white. The *ryot* himself knows what to do, but he continues to cut down forests, overgraze his land and murder the soil which he is holding in trust for future generation. The problem is not an Indian one but an international one and no doubt post-war planning will take into consideration the methods of preventing fair lands from running into a wilderness. (*Science and Culture, Vol. 8 No 2, August 42.*)

ABSTRACT

Kashmir saffron* and its adulterants K. L. Budhiraja,(*J. Indian Chem. Soc. Ind. News Ed. 5,135—38, 1942*) Saffron consists of the dried stigmas of *Crocus sativas* The stigmas are branched and anthers are extrose. Each piece is about 1" long. The weight of 50 stigmas ranges between 0·0716 g. and 0·163 g. The odour and taste are peculiarly aromatic. If floated on water, it is slowly coloured deep yellow and stigma remains yellow even after treatment with water. It is generally sold in the market in the form of hay saffron.

In India saffron is grown in Kashmir only in particular table lands, in Pampur (at a distance of 8 miles from Srinagar) with an altitude of about 5,300 feet above the sea level. The other important conditions besides the soil, peculiar to the growth of saffron, are the climate and the topographical situation of the fields.

* Tamil—*Kungumapu.*

Monsoon does not enter the area. Annual rainfall is about 26". The beds are square with $4\frac{1}{2}' \times 4\frac{1}{2}'$ dimensions and are surrounded by drains. Saffron is grown continuously for a number of years (3 to 5 years). The roots (bulbs) are then transferred to a freshly prepared land. They are not irrigated, excessive moisture being injurious to the crop. The soil must be thoroughly pulverised by continuous ploughing. Transplantation is done in September and the plant flowers in autumn when the crop of yellow stigmata is collected and dried in the sun or by means of a small artificial heat.

Saffron was omitted from 1914 B. P. as being of little medicinal value. In India, however it continues to be a popular drug employed in the indigenous systems of medicine.

Being an expensive drug, it is largely adulterated. Usually it is artificially weighted with sugar, glycerol, oil borax, etc. Sometimes the exhausted saffron is re-dyed. The most common adulterants are the flowers of *Compositae*-Calendula, Arnica, safflower, etc. The reddish brown hairs of the maize fruit after cutting into proper size are also used as adulterants.

Effect of storage on Indian vegetable oils J. S. Aggarwal (*J. Indian Chem. Soc. Ind. News Ed. 5,121—33, 1942*) Vegetable and animal oils and fats deteriorate on keeping, resulting in disagreeable odour and acrid taste, in which state they are commonly described as having developed rancidity. No Industry in which oils and fats are used can afford to overlook the factors which contribute to the development of rancidity. Atmospheric oxidation may be regarded as the most important cause of rancidity. The rate of oxidation varies with the type of fat and the conditions of storage. The majority of oils and fats exhibit a more or less well defined induction period. During this time the fat passes through several preliminary stages of oxidation, the first being the absorption of oxygen followed by the formation of a loose addition compound, in which state the oxygen can be removed by evaporation at elevated temperatures. Various chemical changes follow this stage of absorption.

As regards the effect of the material of the container, it may be seen that all the oils have deteriorated less when stored in glass beakers than in plain steel and tinned steel vessels. For obvious reasons the storing of large amounts of oils and fats in glass containers is not possible, but large earthern pots such as are used in many places in India, may be substituted for glass vessels, if arrangements are made for them to be adequately closed. On account of their having small necks and consequently less surface exposed to air they should be quite serviceable for this purpose, but due to their fragile nature their transport would involve risk of breakage. Such vessels should be internally glazed, otherwise the porous character of the walls will negative the advantage gained by their use.

All the oils in plain steel containers were found to be discoloured after some time. Except ghee and tallow, the other oils oxidised much more in these vessels than in those of tinned steel and glass; this can also be observed from the viscosity values of these oils Cotton seed and sesame oils deposited a certain amount of gummy matter around the walls of the plain steel vessels, but this did not occur when these oils were kept in glass and tinned steel vessels. It would, therefore, appear that vegetable oils intended for use as lubricants should never be stored in iron vessels. The effect of iron was much more severe in the case of sesame oil than in others; it may not, therefore, be advisable to use sesame oil for lubrication purposes in machinery where it will be freely exposed to bare iron surfaces. S. V. D.

Closer examination of Fisher's analysis of variance as applied to the data of certain field experiments by Uttamchand Tashna, M. A. (*Punjab Agri. Coll. Mag. 10, 7—21, 1942*) The paper deals with the results of statistical analysis of four

field experiments in cotton conducted under the cotton physiological scheme financed by the Imperial Council of Agricultural Research in Punjab. The straight forward analysis of variance showed that the treatment differences were not significant in all the four cases. The error variances were high and the author has shown that in such cases partitioning of the degrees of freedom for treatments and for error bring to light certain significant treatment comparisons which were in conformity with field observations. It was also shown by the author, how by replacing certain abnormal values by the missing plot technique and rejection of certain blocks or plots based on field observations, significance was reached between treatment differences In the last example, where the close relation between mean and range implied skewness in the material adoption of the logrithmic transformation of the values helped to bring out significant treatment differences. The author has shown through examples, how the treatment differences which were found in significant by ordinary analysis of variance, should be used for further study instead of rejecting them. T. N.

The effect of washing and cooking on the vitamin B_1 content of raw and parboiled rice M. Swaminathan (*Indian J. Med. Res. 30,409—16 July 1942*) The fact that milled parboiled rice has a higher vitamin B_1 content than milled raw rice is now well known. Results of tests on the loss of vitamin B_1 in washing the rice before cooking and in throwing off the cooked water, are presented in this paper. It was observed that milled raw rice loses the greater part of its vitamin B_1 (60 per cent) during the process of washing, while milled parboiled rice, in spite of its higher vitamin B_1 content, loses much less (8 per cent). Washed parboiled rice contains on the average four times as much vitamin B_1 as washed raw rice. About 25 per cent of the vitamin contained in both the types of rice is dissolved out in the cooking water. But cooked parboiled rice, even when the cooking water is discarded, contains enough vitamin B_1 to prevent the occurence of beriberi.

In raw rice, most of the vitamin is located at the surface of the grain and is readily washed away. In parboiled rice it is located more deeply and is less easily dissolved out by the washing water. This investigation confirms the original hypothesis of Aykroyd that 'when rice is parboiled the endosperm absorbs vitamin B_1 at the expense of the germ and pericarp, and milling does not remove the vitamin'.

M. A. S.

Vitamin C content of guavas by W. W. Boyes and D. J. R. de Villiers (*Farming in South Africa, Vol. 17, No. 194, May 1942*) South African guavas are not yet classified into varieties. Five main types of fruit are described in this article, and it is shown that the vitamin C content depends greatly on the type of guava in question. Early-season guavas are generally lower in vitamin C content than later-season types. The vitamin C content does not always seem to be greatly dependent on maturity, but there may be exceptions. The skin and outer flesh of the guava are richest in vitamin C. Very little vitamin C is lost in the stewing of guavas. Concentrated guava extract lost its vitamin C very rapidly but canned guavas proved to be remarkably stable under adverse conditions. Dried guavas and guava powders have been prepared; though rich in vitamin C, the potency is rapidly lost in warm climates. Investigations regarding the vitamin C content of the guava and guava products and the stability of the product and its vitamin during storage are being continued. (Authors' abstract).

GLEANINGS

Dried food The necessity of shipping powdered and dried foods is keenly felt in these days of drastic shipping shortage. It has been pointed out by a group of foodmen who met recently in Chicago that in consequence of the high percentage of water in fruits and vegetables, e. g. 75 to 95 per cent, several thousand tons of water are being shipped every year by U. S. A. to different countries. For instance, last year U. S. A. shipped as much as 150 000 tons of water to Great Britain and a still greater amount to Philippines and Iceland. The dehydrating of eggs and milk is quite well known. The results of scientific dehydration have indicated that the process does not destroy the flavour of the fruits and vegetables and preserves 90 per cent of its vitamin value. In this connection mention may be made of a new technique developed by the Sardik Food Products Corporation of Manhattan, which consists in making a pulp of the fruits and vegetables and then spreading it in a thin film of $\frac{8}{100}$ in. width on revolving drums. In this state the application of heat removes as much as 96 per cent of water in a few seconds. Steaming food-stuffs stand little risk of oxidation, and where it is still apprehended heating can be performed in vaccum. It is interesting to note that the food stuffs come out like an endless sheet of paper which easily crumples into fine particles. Tomatoes, peaches, peas, squash, potatoes, apples, bananas, etc. can be dehydrated in this way, and keep well for more than three years. The food can be best served after slightly warming it with water.

It has been estimated that apart from the simplification of handling, packing and shipping difficulties, the mass production of dried foods will be 20 per cent cheaper. In Germany the number of dehydrating plants has increased from six before 1935 to 114 in the current year. The National Dehydrators Association of U. S. A. has adopted schemes of expansion which will enable them to quick-freeze an estimated $ 90,000,000 worth of food in the current year, that is, about 180 times the volume that was handled ten years back. *(Science and Culture Vol. 8, No. 2, August 1942.)*

Storage of food in wartime Britain. The Ministry in Britain are building about 150 single storeyed, pre-fabricated steel buildings with concrete floors, brick walls and steel and asbestos roofs, called "national store cupboards" for conserving tons of the nation's reserve foods and raw supplies. The structural work will protect the food against damp and insects and the danger of bombing. *(Science and Culture, Vol. 8, No 2 August 1942.)*

Wax from sugar-cane During the war of 1914—18, sugar-cane wax was obtained as a by-product in South Africa; the manufacture continued up to 1930 when it was no longer a paying process. During the present war, U. S. A. is attempting to manufacture it at Louisiana, the estimated amount is stated to be 6 to 7 million pounds.

The wax is present on the stalks of sugar-cane as a thin layer; the amount, however, is very small, even less than 2 lb. per ton of sugar-cane (*i. e*, less than 0·1 per cent) The dried press-cake of mud from the clarification of cane-juice, is solvent extracted—the wax representing 5-17 per cent of the cake. Some fat always accompanies the wax, and makes the latter sticky. It also lowers the melting point of the wax. The fat suffers putrefaction to some extent on standing, and a harder wax is possible to obtain therefrom. But the unpleasant odour associated with the wax thus obtained has been found to be largely due to the putrefied fat. Toluene has been suggested as a suitable solvent, practically all of which can be recovered. Efforts are being made to separate the fat from the

wax. This can be done by a cold diffusion process using acetone as a selective solvent. It has been proposed to set up a pilot plant in Louisiana to study the problem on a semi-industrial scale.

It seems worth while whether or not the problem can be taken up by the Imperial Institute of Sugar Technology at Cawnpore. In case the process proves successful in India, it will, to some extent, reduce the cost of production of cane sugar and may thereby mean some relief to the poor consumers of sugar in this country. P. B. S. (*Science and Culture, Vol. 8, No. 4, October 1942.*)

Groundnut oil for diesel engines Since the publication of laboratory results on the subject by J. S. Aggarwal and others an opportunity was awaited to supplement the information by results obtained under actual working conditions. The difference in prices of crude oil and groundnut oil and the general apathy and fear for anything new delayed taking any trials so far.

To obtain continuous supply of crude oil in the mofussil is getting more difficult every day. Where the water supply, as of this place (Sangli), depends for its power requirements ultimately on crude oil and alternative arrangements are not possible, the water service may have to be maintained irrespective of considerations of costs. It was thought proper therefore, to try groundnut oil (available in plenty locally) as an experiment for future use and guidance.

The local power house has two '*Deutz*' diesel engines rated 165 bhp. and coupled to a three phase AC generator each. Both the sets have to run together for most of the time the power house is working. Without disturbing the routine work, one of these engines was run on groundnut oil for ten days. It was also possible to run this engine for a short while on 103 kw., its normal load when the consumption came out to be 0·452 pounds per kwh. Taking the efficiency of the generator as 90 per cent., it works out as 0·303 lb. bhp—hr.

The makers recommend light diesel oil (commonly known as "A" grade) for this engine and the test certificate of the engine gives 0·384 lb. bhp-hr, as the consumption of fuel. Presumably, the test is carried out with a fuel similar to "A" grade oil, and comparing these results it can be seen that the groundnut oil bids fair to be a substitute for "A" grade crude oil. However, from the end of 1939 to this day, only "B" grade crude oil has been used and now a comparison with this oil shows the following in favour of groundnut oil:—

(1) Absence of black smoke from the exhaust.

(2) Less carbon deposit on the piston top or in the combustion chamber.

A slight deposit of organic matter was observed round the spray nozzle but it did not interfere with the working of the engine in any way. The consumption on an average load of 64 kw. did not materially differ in the case of the two fuels.

These observations are published in the hope that many others will try groundnut oil and pool their experience so that a war time difficulty may be solved. R. V. Barave and P. V. Amrute. (*Current Science, Vol 11, No. 10, Oct 42.*)

Some significant findings of the U. S. A. Agricultural Experiment Stations in 1941 In a search for cheaper sources of nitrogen in animal feeding, experiments with urea, a non-protein compound in which the nitrogen generally costs only from one fourth to one third as much as its equivalent in the usual protein supplements, have been carried on in several States and Hawaii. The Wisconsin Station obtained very favorable results with urea as compared with linseed meal for dairy cows as to milk production, butterfat, protein, and vitamin C content of the milk, and the production of normal calves. In lamb feeding a lower value for urea than for linseed meal has been obtained by the New York (Cornell)

Station when used as a practically exclusive source of nitrogen, but with equal parts of the two feeds the combination was only slightly less valuable than linseed alone.

Wide variations in fertilizer requirements of sugarcane under different environmental conditions have made economical use of fertilizers difficult of determination. The Hawaii Station, in co-operation with the Hawaiian Sugar Planters Association, has found that, by sampling the sheath of the young mature leaf and determining the content of sugar, water and minerals, a very reliable guide for fertilizing and irrigating can be obtained, based on known responses on soil types under local conditions of light and temperature. Such intensive applications of fundamental scientific knowledge promises to decrease costs of production by securing sugar accumulation close to the highest level possible. This is an important contribution to the economic stability of a territory largely dependent on its efficiency in production on a little over a quarter of a million acres.

The Missouri Station has succeeded in chemically combining the proteins of skim milk with iodine to produce an artificial thyroprotein which has the physiological properties of thyroid substance. In short feeding trials, milk production of goats was increased by feeding 5 to 10 gm. daily of the artificial thyroprotein, and cows which were falling off in milk production were stimulated to produce more milk by feeding 50 to 100 gm daily. This cheap source of thyroprotein may prove a practical way of increasing milk production of dairy cattle. —*Experiment Station Record.* (*Science, New Series, Vol. 96, No. 2482.*)

The conservation of activity in Papain The precise nature of the enzymic activities of papain has been the subject of considerable uncertainty and disagreement The differences in the properties of freshly tapped latex obtained from fruits at different stages of development, variations in activity of preparations made by different methods from the latex, deterioration in activity on keeping, the action of "activators", notably hydrogen cyanide, in increasing or restoring activity, and the presence of natural activators and inhibitors in the latex, have all been the subjects of contributions to technical journals.

Reference may be made in particular to a communication made to *Nature* (*1937 139, 249*) by M. Frankel, R. Maimin and B. Shapiro, of the Hebrew University, Jerusalem, and to various papers by A. K. Balls, of the United States Department of Agriculture and his collaborators (*J. Biol Chem., 1937, 121, 737*; *ibid., 1939, 130, 669*; *Ind. Eng. Chem., 1940, 32, 1144*; *ibid, 1940, 32, 1277*).

Pending clarification of these various problems a practical interest attaches to United States patent No. 2,257,218, September 30, 1941, granted to A. K. Balls, H. Lineweaver and S. Schiwmmer, assignors to the Secretary of Agriculture of the United States, entitled "Process for the Preparation of Papain". It is claimed by the patentees that whereas papain as ordinarily prepared by drying the latex of the green fruit is less potent per unit of dry weight than the latex from which it is prepared, and deteriorates on storage even for periods as short as few weeks, the new process results in a product which retains nearly all the original activity of the latex and may be stored for many months without apparent deterioration. It is stated that the natural activator of the proteolytic enzymes, which occurs in the latex in considerable quantity, remains in the finished papain.

The process consists simply in adding common salt to the latex, either before or after it is clotted, mixing thoroughly, and then partially drying the mixture, preferably in a vacuum and at a temperature not exceeding 55°C. The quantity of salt used may vary within wide limits, but with latex of average

water content may be about one-tenth of the weight of the fresh latex. The evaporated product, consisting of a greyish white thick paste, should be kept in airtight containers. (*Bull. Impl. Inst. Vol 39, No. 4, October-- December 1941.*)

Cement as a fire extinguisher. In the January twenty-third issue of *Science* there is a short article on the use of pitch as the best incendiary extinguisher by Dr. R. Sayres, Director of the U. S. Bureau of Mines

It would seem to the writer that a good deal of caution must be used in the application of pitch to extinguish fire, even though it originates from a magnesium incendiary bomb. It has been the experience of the writer with a great variety of small fires in oil, metals and other materials, there is nothing so satisfactory and so foolproof as Portland cement as it is placed on the market. In many cases in the writer's experience it has been highly successful in extinguishing fires where water, carbon tetra-chloride, foam and similar substances have been unsuccessful. This very common material so easily available and so safe to use should be placed at points where there is danger from fires either from incendiary bombs or from normal causes.

In our own laboratory, we provide such material easily available in kegs and find it far more successful than the usual fire extinguishers. Furthermore, it gives off no injurious gases and is in itself not combustible, as in the case of pitch. Roy Cross, Kansas City Testing Laboratory. (*Science, March 13, 1942*)

A simple treatment for preserving gunny bags. A simple method of rot proofing sand bags, sacks and hessian is described by Dr. C. J. Magee, Acting Chief Biologist of the Department of Agriculture, New South Wales, Australia. The treatment consists of dipping the bags in a preserving solution, wringing and drying them; (for use on the farm, about one-eighth or one-quarter of the quantities given below should be ample) The method is as follows:—

Dissolve 10 lb. of bluestone (copper sulphate) in 35 gallons of water in a wooden vessel—not one of iron or galvanised iron. Dissolve separately in another vessel 11½ lb. of washing soda crystals (or 4½ lb. of soda ash) in 5 gallons of water. Then, while stirring, add the soda solution slowly to the bluestone solution. Add a wetting agent, for example, Wetsit or Agral 3, and stir the mixture well. (If a wetting agent is not procurable merely increase the time of treatment.)

Immerse the sandbags one by one until the fabric and stitching thread are thoroughly wet which may take up to five minutes. Also dip the twine which will be later used for sewing the bags. Take out the bags and remove the excess liquid by running through a clothe wringer or mangle. The bags are then ready for immediate use or they may be dried and stored. (*Agri. Gaz. N. S. W. April 1942.*)

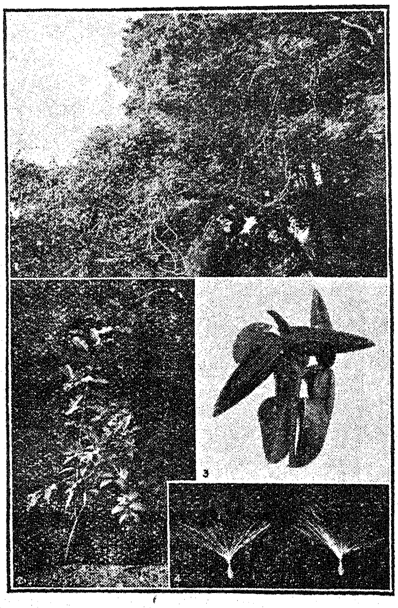
RESEARCH ITEMS

***Cryptostegia Gradiflora* R. Br. (*Asclepiadacea*)—a promising short term rubber vine**

Rubber is one of the most essential requirements in the modern civilized world. It is not only a necessary commodity in times of peace but is an essential and indispensable necessity in times of war where mechanised armies travel on rubber and the building of the modern weapons of warfare would have been impossible without it. Rubber is primarily a vegetable product. Though it is obtained from several species of plants, the chief source of rubber of commerce is the Para Rubber tree *Hevea braziliensis* M. Arg., which is a native of Brazil and other South American countries. It is from here that the plant spread to Ceylon, Burma, Malaya, French Indo-China, Dutch East-Indies and other Pacific islands, where it is planted on extensive areas. The area under rubber in our country is

very limited and at present chiefly confined to parts of Travancore, Cochin and Malabar. Owing to the great demand for rubber that is felt at the present day, various attempts are being made for an immediate increase in the output of rubber in this country. The rubber tree, *Hevea braziliensis* M. Arg., yields rubber only after 6 or 8 years of growth and hence an immediate increase in the output of rubber production by planting more of these trees is not possible. Moreover for successful plantation of this species a heavy humid and warm tropical climate with a fairly heavy rainfall, as is obtained in Travancore, Cochin and parts of Malabar, are essential. These facts therefore necessitated the search of other sources for obtaining rubber almost immediately. Two lines of investigation present themselves. The first is the search for such plants as would produce rubber and that might be existing in the jungles in abundance and which could be tapped for rubber almost immediately. The second is the finding of quick growing plants with rubber content that could be cultivated on a large scale and rubber extracted within a short time, almost the same year they are planted.

Preliminary investigations on this problem were carried out very recently at the Agricultural Research Institute, Coimbatore, at the instance of the Madras Government. A large number of latex-bearing plants have been tested for their rubber content. In most cases the latex (milky juice) could not be coagulated by any of the common methods known. In a few instances, the latex was coagulated, but the resulting substance was very high in resin content and consequently too sticky to be useful as rubber or rubber substitute. One plant alone, *i.e.*, *Cryptostegia grandiflora* R. Br., has given very satisfactory results so far. This plant is very rich in latex and the latex was easily coagulated by dilute acetic acid and the rubber thus obtained was of a very good quality very nearly equal to Para Rubber in its physical properties.



Cryptostegia grandiflora R. Br.—the rubber vine. 1. An old vine climbing over a babul tree. 2. An young plant of about 2 years old. 3. A branch with two pairs of fruits (follicles); note the paired nature of the follicles. 4. Seeds with tufts of silky hairs.

Cryptostegia grandiflora R. Br., is an attractive woody climber and when allowed to grow by itself without support, attains a beautiful bushy growth of about 10 feet high. If allowed to climb on other trees, it grows up to the very top and spreads over on all sides. The plant is very conspicuous with its large showy rosy flowers and fairly big triangular fruits in pairs without stalks. Each fruit (follicle) is about 5 in. long and from 1 in. on each of the three faces gradually diminishes to a point towards the free end. The fruits, when ripe, dehisce by means of longitudinal slits along the middle of the outer triangular face liberating a large number of small flattened wedge-shaped seeds which are provided with long silky hairs, with the aid of which they float in air like parachutes and are carried to considerable distances from the parent plant. This plant is a native of tropical Africa and was introduced into this country many years

ago and has become more or less naturalised. It is said to occur in this Province but its exact distribution and extent are yet to be ascertained. Investigations are under way as to the best method of propagation of this plant on a large scale, its growth habits, latex-producing properties, best method of extraction of latex, the methods of coagulation of the same, etc., with a view to finding out the possibility of its being grown as short term rubber crop.

Agricultural Research Institute, Coimbatore, 9-1-1943 — S. N. Chandrasekhara Ayyar, T. V. Reddy

(The authors will be thankful, if any of our readers give early information regarding the occurrence of this type of plant in any locality.—*Ed.*)

The mode of inheritance of a "Dwarf bushy" type in *G. herbaceum*

A "dwarf bushy" plant was first observed in the F_2 population of a cross between 1027 A. L. F. and H_1, two strains of *Gossypium herbaceum* var. *frutescens*. The two parents were in general 40 to 50 cm in height at this station, and had internodes of about 2 to 2·5 cm. in length The "dwarf bushy" plant, when fully

Normal Dwarf bushy

grown was only 20 cm. in height and had an internodal length of one cm. on an average and 5 to 6 monopodial branches at the base as compared to one or two in the parents. The short habit coupled with the presence of a number of monopodia at the base gave a bushy appearance to the plant (see Plate). Only a few bolls set in this plant. Their seeds when sown, gave rise to plants similar to

the parent indicating it to be homozygous for the character. This plant was crossed with H_1, the standard strain of this station. The F_1s resembled the normal parent in appearance. In the next year, height, number of internodes and number of monopodial branches were studied in the parents as well as in the F_2 population.

Season	Generation	Selection Number	Average height of plants	Average number of internodes	Average length of internodes	Average number of monopodia	Number of plants
1940–41	F_1		86 cm.	33	2·6 cm.		
1941–42	P_1	H_1	48 „	19	2·5 „	1·2	
	P_2	"Dwarf bushy" parent	21 „	19	1·1 „	5·6	
	F_2—	Normals	37 „	19	2·0 „	1·2	307
	$H_1 \times$"Dwarf bushy"		18 „	18	1·0 „	5·1	106

Inheritance When counts of each type of segregate were made in the F_2 generation, there were 307 normal plants to 106 of the "dwarf bushy" type. The fit for a monohybrid ratio was good, the value of P being>·50. When progenies of 6 normal segregates of F_2 were studied in F_3, two were pure for normal, while progenies of four plants showed segregation for normal and "dwarf bushy", the actual figures being 177 and 61 respectively. The fit in this case too was good (P>·5). It was clear from this that the new type was a simple recessive to normal and should have arisen as a point mutation. The symbol of Db is given to this gene.

Summary A plant was observed as a mutant in *G. herbaceum* cotton with short internode and a high number of monopodia at the base, at the Agricultural Research Station, Hagari. This character when crossed to the normal was found to behave as a simple recessive to the normal. The gene responsible for this is designated as Db.

Dry Farming Station, Hagari, 23—11—1942.

M. Venkoba Rao
C. K. Ramachandran

Hints for Bee-keepers*

For January

During normal years this month is quite favourable for bee activity. Pollen is available in plenty from a variety of plants and trees such as *cholam, cumbu, maize, Peltophorum, ferrugineum, Ailanthus excelsa*, etc., and nectar from the indigenous and Cambodia cottons The weather is mild and agreeable. The bees collect and store their food materials in large quantities. There is brisk breeding and rapid comb construction. Comb foundation sheets or clean combs of the previous season may be given to economise the energy and labour of the bees. Along with the workers drones also are bred in large numbers during the month. As the latter serve no useful purpose after fertilising the queen, they should be eliminated. The adults can be controlled by the use of the drone-trap and the brood itself may be cut out and destroyed. The accelerated breeding of workers and drones generally forestalls swarming and one has, therefore, to keep a sharp lookout for the issue of swarms. The firstone may be hived and kept as a separate colony and the issue of further swarms, if any, from the original stock should be prevented. This may be achieved by allowing the first queen to emerge

* It is proposed to publish every month practical hints for bee-keepers.—*Ed.*

and destroying all the other queencells. This month also happens to be the season for the birth of new queens and it is likely that some of them may get lost during their mating flights, thus rendering their respective colonies queenless. Immediate steps must be taken to re-queen such colonies. The season is also favourable for the increase of stock. Wild nests are usually in prime condition and these may be hived with advantage. It may also be worth while to be on the look out for stray swarms, which may issue from the wild colony. Old mud pots can be kept under shady bushes and hedges or at convenient places on trees to attract these swarms. The month is also favourable for rearing queens.

In localities having luxuriant vegetation in bloom colonies may attain sufficient strength to gather and store honey. These must be provided with supers. The two side combs of the brood-chamber, which are usually stocked with honey may be cut and fixed on the super frames as it will encourage the bees to come up and work in the supers. Apart from these the hives should be kept clean and stray enemies such as lizards, ants, wasps, etc., must be eliminated.

For February

The general flowering season for most plants, shrubs, and avenue trees commences from this month and as such it happens to be one of the best periods of honey flow. The pollen sources of the previous month continue to be in flower and the nectar supply is augmented by the profuse flowering of Cambodia and indigenous cottons. Apart from these a number of minor sources of pasturage such as *Holoptelia integrifolia*, drumstick, citrus, garden plants and a variety of weeds also come into flower. The weather comprises of bright, warm and dry days and cool nights. Such extremes of temperature are said to be conducive to a copious secretion of nectar from flowers. As regards the care and management of the bees, the aspects such as comb construction, breeding, swarming and its control etc., dealt with in the note for January hold good for this month also. The bees continue to exhibit remarkable field and hive activity. The availability of honey is evinced by the distended abdomen and the consequent bigger size of the bees as well as by their amenability to handling. Inside the hive, the plentitude is evident from the liberal secretion and use of pure white wax in patching up crevices, sticking up together frames, etc. Comb-building actually continues both by building fresh combs as well as by elongating the cell walls of old combs mostly for storing honey. The newly extended portions have a glistening silvery colour. Appreciable quantities of honey may be found stored in the combs. The bee-keeper should take advantage of these indications and provide the necessary facilities for storing honey. The first step is to add a super and the necessity for the same would be indicated by the crowding of a large number of bees under the top and at the entrance during nights. To start with, one super may be given and its number increased later, if necessary. As already mentioned, the side combs of the brood chamber which are usually stocked with honey may be cut and fixed to the super frame as the bees are generally slow in constructing them there. The combs have to be occasionally examined as the bees often exhibit a tendency to paste them together.

As swarming happens to be at its peak during this month, a few hints on having swarms and their after-care may not be out of place here. The bees which issue from the hives usually settle in the open in a cluster and remain there for some time. This cluster is known as a "swarm". This can be transferred to a hive by holding an open box with a frame of unsealed brood under it, in such a way that half the cluster is inside the hive. The bees being attracted by the brood quickly get into the hive. If they do not, they may be gently brushed with a broom or transferred with the hand. If the swarm has settled in an inaccessible place, the hive can be slung on to a pole and then held beneath

the swarm. The hive may then be filled with the other frames and kept in a convenient place.

Generally swarms work very briskly and with a little care they can be made to yield honey within a couple of months after hiving them. Old combs or comb-foundation sheets may be given to the empty frames to save the time and energy of the bees. Feeding with a little sugar syrup or dilute honey will also accelerate their activity. *M. C. Cherian & S. Ramachandran.*

Press Notes

Backyard Cultivation*

The production of an adequate supply of fresh vegetables and a few fruits for the family use is the primary object of backyard cultivation. Few people realise the large number of different crops that can be grown successfully in their backyards. To many, backyard is essentially a waste ground, ill-kept, to be screened away from the eyes of visitors. Here we find the place for dumping the kitchen refuse, cattle-house rubbish and an assortment of discarded household articles. That a backyard can be converted into a place of pleasure and profit is realised by few. Under the present emergency conditions it is almost a crime to waste such valuable land, which can be easily utilized for growing food crops or vegetables to make up their existing shortage. Self-sufficiency is an important part of our war effort, and the home compound can contribute to an appreciable extent to increase our food supply. The cultivation of backyards should therefore be viewed as a duty which every one owes to himself and his family under the stress of circumstances imposed by the war.

In recent years the importance of vegetables in the diet to supply vitamins, mineral salts and cellulose is being stressed more and more by medical authorities and nutrition experts. Because of these various valuable properties, vegetables and fruits are termed as "protective" foods and their daily use in our diet is strongly recommended for safeguarding health, growth and efficiency. They are specially valuable to vegetarians to whom egg and meat are proscribed. The laxative properties of these foods are of value in preventing chronic constipation.

It is also to be remembered that fresh vegetables and fruits when harvested from the backyard and used within a short time are far superior in taste to those purchased from the bazaar. The home garden is also a centre of interest for the children. Besides meeting the needs of the family in the matter of food supply, the home garden can also be made a source of revenue. The surplus water from the wells and washing rooms, the litter and trash from the kitchen and stables and the spare time of every member of the family can also be put into profitable use. Loss by the frequent deterioration of bazaar-purchased vegetables is avoided. The increased production of vegetables at home relieves to a considerable extent the transportation difficulties and marketing problems, which are bound to be acute during the present emergency period. Home-grown vegetables and fruits are also more economical, as in their case no transportation charges are added to swell the cost. Above all, the pleasure of seeing plants grow, and the satisfaction of converting a piece of bare neglected piece of land into an attractive garden should give an added interest to every member of the family.

Broadly speaking, our vegetable and fruit crops can be divided into two main groups, one suited to the higher altitudes like the Nilgiris and the Kodaikanal

* Radio talk from the A. I. R. Stations, Madras and Trichinopoly, in Telugu and Tamil, on 25th and 28th November 1942.

and the other suited to the plains. Under certain conditions, however, a large number of hill vegetables can be grown on the plains and *vice versa*. Cabbage, cauliflower, knol-khol, lettuce, peas, radish, turnip, carrots, potato among the vegetables and cape gooseberry, strawberry, tree tomato among the quick growing fruits primarily fall under the hills crops. On the plains brinjal, chillies, cowpeas, cluster beans, sweet potato, tapioca, alocasias, colocasias, yams, coriander, *bendi, dondakai, basala*, onions, garlic, cucumbers, melons, pumpkins, gourds, papayas and bananas are the chief backyard crops in the plains. Tomato is one of the outstanding garden crops which thrives both on the hills and plains. There are a large number of slow growing trees which can also be grown in backyards either for their fruit or for culinary purposes, such as bread fruit, mango, tamarind, phyllanthus, drumstick, carambola and spondias. These, however, require more space and considerable time to yield fruits and do not always therefore appeal to the home gardener as much as quick growing vegetables and fruits, mentioned previously.

The home garden offers, however, little choice in the matter of soil or location. The owner is compelled to make the best of the available land. Fortunately, however, there are a very large number of vegetable and fruit crops which can stand adverse conditions, and this permits the backyard cultivation even in less favoured sites. If there is a choice open, it is best to select a sandy loam soil which suits most vegetables. A heavy soil can also be improved considerably by applying coarse manure or organic matter. Raising of green manure crops like daincha, sunnhemp and *pillipesara* for ultimate incorporation into the soil is a useful devise to bring heavy soils into a proper physical condition.

Since no one garden plan will suit all conditions and all tastes it is best to make a plan before the crops are sown. A plan will simplify the future work and economise home gardening. The main objective of the plan should be to provide a supply of fresh vegetables and fruits to the family throughout the year. Before making the plan, the exact area available for gardening should be determined. Separate plots should be allotted for vegetables and fruit according to their duration and time taken for producing fruit and also according to their cultural requirements. Perennials should be grown in a separate place. The available space should be divided into two or three plots to permit the raising of different seasonal vegetables separately and to allow successive sowings to be made. Vegetables that require pandals for support should be allotted a separate area. The plan should also provide for the growing of short duration crops in between long duration types. This will lead to economy of space. As the same kind of vegetable does not come up well in the same site, when grown year after year and as certain diseases will be perpetuated thereby, the plan should provide for rotation of crops. Vegetables and fruits which require more ample irrigations should be planted close to the wells. These various hints as well as instructions on the culture of each vegetable are discussed in detail in a series of leaflets which are to be published by the Department of Agriculture shortly. The listeners are requested to obtain the leaflets from the nearest Agricultural Demonstrators.

Good seed is the foundation of vegetable culture, as good plants are essentia for successful fruit growing. It will be to the advantage of the grower to obtain seeds and planting material from firms of established reputation or from the neighbouring houses where excellent crops have been raised. In the case of certain crops seed setting is not always favourable in this province, while in some others the home grown seed deteriorates in quality after one or more seasons. The help of the Agricultural Demonstrator should always therefore be sought in making the purchase of seeds and plants.

The home gardener is usually deterred from taking to vegetable and fruit growing on the fear that he lacks practical experience. It will not take long for him to find out that the subject is not such a mystery that cannot be mastered by any lay person. The publications on the subject shortly to be issued by the Department of Agriculture will contain all the practical hints that an average home gardener should need. With some enthusiasm and with an urge to safeguard the family's food supply and health, home gardening should prove to be an avocation of absorbing interest and profit. (*Department of Agriculture, Madras*).

Crop and Trade Reports

Statistics—Paddy—1942-43—Second forecast report The average area under paddy in the Madras Province during the five years ending 1940-41 represents 13·3 per cent of the total area under paddy in India. The area sown with paddy up to 25th November 1942 is estimated at 9.149 000 acres. When compared with the area of 8,737.000 acres estimated for the corresponding period of the previous year, it reveals an increase of 4·7 per cent.

The area estimated is the same as that of last year in Chittoor and the Nilgiris. An increase in area is estimated in the other districts of the Province except in Bellary, Chingleput, North Arcot, Coimbatore and Tinnevelly. The variations are marked in Vizagapatam (+100,000 acres), Kistna (+70,000 acres), South Arcot (+105.000 acres), and Tinnevelly (−65,000 acres).

The first crop of paddy is being harvested in parts of the Province. The yield per acre is expected to be normal in Salem, Madura, Ramnad, Tinnevelly, Malabar, South Kanara and the Nilgiris and below the normal in the other districts of the Province due generally to insufficient rains and inadequate water-supply for irrigation during the growing period of the crop. The crop was affected to some extent by insect attack in parts of the districts of East Godavari, West Godavari and Tanjore. The seasonal factor for the Province as a whole works out to 91 per cent of the average as against 97 per cent in the corresponding period of the previous year.

Paddy—1942-43—Intermediate report The main crop of paddy has been or is being harvested in parts of the Circars, the Deccan, the Central districts, Tanjore and Madura. The yield per acre is expected to be generally below the normal due to insufficient rains and inadequate water-supply for irrigation during the growing period.

The main or first crop of paddy in parts of the Circars (deltas excepted), the Deccan, the Carnatic, Chittoor, North Arcot and Trichinopoly, the semi-dry and dry paddy crop in Ramnad and the second crop paddy in Malabar have been affected by drought. The rains received in December 1942, have improved the late sown crops in parts of the Carnatic, North Arcot, Tanjore and Ramnad. The condition of the crop is generally satisfactory in the other districts of the Province.

The wholesale price of paddy, second sort, per imperial maund of 82 $\frac{2}{7}$ lb. as reported from important markets on 14th January 1943 was Rs. 6—15—0 in Chittoor and Tinnevelly, Rs. 6—10—0 in Madura, Rs. 6—3—0 in Virudhunagar, Rs. 5—12—0 in Kumbakonam, Rs. 5-7-0 in Cuddalore and Trichinopoly, Rs. 5-6-0 in Vellore, Rs. 5—4—0 in Hindupur, Rs. 5—0—0 in Conjeevaram, Rs. 4—14—0 in Nagapatam, Rs 4—12—0 in Bezwada and Masulipatam, Rs 4—11—0 in Guntur, Rs. 4—10—0 in Rajahmundry and Ellore, and Rs. 4—5—0 in Cocanada. When

compared with the prices published in the last report i. e., those which prevailed on 7th December 1942, these prices reveal fall of approximately 23 percent in Conjeevaram, 12 per cent in Vellore, 11 per cent in Guntur, 9 per cent in Cocanada, 6 per cent in Rajahmundry, Ellore and Bezwada, 5 per cent in Trichinopoly and 3 per cent in Cuddalore and a rise of approximately 10 per cent in Chittoor, 5 per cent in Madura, 4 per cent in Hindupur, 3 per cent in Nagapatam and 2 per cent in Kumbakonam the prices remaining stationary in Masulipatam.

Statistics–Sugarcane–1942–Intermediate forecast report The sugarcane crop is reported to have been adversely affected to some extent by insufficient rainfall in the growing period and want of water for irrigation in parts of the districts of East Godavari, Bellary, Chingleput, South Arcot, Chittoor, North Arcot, Trichinopoly and Ramnad. The cane in the northern taluks of the Vizagapatam district is reported to have been damaged to some extent by cyclone. The condition of the crop is generally satisfactory in the other districts of the Province and the yield per acre is expected to be normal. In the South Kanara district, the yield is estimated to be slightly above the normal because of the larger area under improved canes.

The wholesale price of jaggery per imperial maund of 82$\frac{2}{7}$ lb as reported from important markets on 7th December 1942 was Rs. 13–12–0 in Adoni, Rs. 12–8–0 in Salem, Rs. 12-2-0 in Mangalore, Rs. 10-8-0 in Cocanada, Rs. 10-5-0 in Vellore, Rs. 9–14–0 in Rajahmundry, Rs. 9–12–0 in Coimbatore Rs. 9–11–0 in Trichinopoly, Rs. 9–4–0 in Chittoor, Rs. 9–2–0 in Vizianagaram, Rs. 7-13-0 in Bellary, and Rs 7–12–0 in Vizagapatam. When compared with the prices published in the last report, i. e., these which prevailed on 9th November 1942, these prices reveal a rise of approximately 14 per cent in Mangalore and 11 per cent in Vizianagaram and a fall of approximately 32 per cent in Chittoor, 24 per cent in Vellore and Coimbatore, 21 per cent in Trichinopoly, 12 per cent in Bellary, 11 per cent in Adoni, 9 per cent in Cocanada and 8 per cent in Rajahmundry, the price remaining stationary in Salem,

Statistics–Castor–1942–First or final report The average area under castor in the Madras Province during the five years ending 1940-41 represent 18·4 per cent of the total area under castor in India. The area under castor in the Madras Province up to 25th November 1942 is estimated at 273,300 acres. When compared with the area of 244 900 acres estimated for the corresponding period of last year, it reveals an increase of 11·6 per cent. The estimate of last year was more than the actual area of 243,954 acres by about 0·4 per cent.

The crop is mainly grown in Guntur (24 000 acres), the Deccan (148.000 acres), Nellore (36 500 acres) and Salem (21,000 acres). It is not grown in Chingleput. The area is estimated to be the same as that of last year in Vizagapatam, Guntur, South Arcot, Tanjore and Tinnevelly. An increase in area is estimated in West Godavari, the Deccan, Chittoor Salem, Coimbatore and Ramnad and a decrease in area in the other districts of the Province.

The yield per acre is expected to be normal in Vizagapatam, East Godavari, West Godavari, Nellore, South Arcot, Salem, Tanjore, Madura, Ramnad, Malabar and South Kanara and below normal in the other districts of the Province. The seasonal factor for the Province as a whole is estimated at 90 per cent of the normal. On this basis, the yield is estimated at 24,800 tons as against, 24,300 tons estimated for the corresponding period of last year and 23,400 tons estimated in the Season and Crop Report of last year.

The wholesale price of castor per imperial maund of 82$\frac{2}{7}$ lb. as reported from important markets on 21st December 1942 was Rs 11–1–0 in Nandyal, Rs. 10–8–0 in Cudapah, Rs. 10 in Vizianagaram, Rs. 9–14–0 in Anantapur, Rs. 9–5–0 in Hindupur and Rs. 7–15–0 in Bellary. When compared with the prices which prevailed on 22nd December 1941, these prices reveal a rise of approximately 126 per cent in Hindupur, 121 per cent in Cuddapah, 119 per cent in Anantapur, 108 per cent in Nandyal, 87 per cent in Bellary and 70 per cent in Vizianagaram.

Statistics—Pepper—1942–Final report The area under pepper in 1942 in Malabar and South Kanara is estimated at 108,200 acres (99,500 acres in Malabar and 8,700 acres in South Kanara) as against the final area of 105,019 acres (96,368 in Malabar and 8,651 acres in South Kanara) in the previous year.

The condition of the crop is satisfactory and the seasonal factor is estimated to be normal in both the districts as against 95 per cent in Malabar and 100 per cent in South Kanara in the previous year. On this basis, the yield is estimated at 40.390 tons (9,550 tons in Malabar and 840 tons in South Kanara) as against 9 030 tons (8850 tons in Malabar and 830 tons in South Kanara) estimated in the previous year.

The wholesale price of pepper per imperial maund of 82$\frac{2}{7}$ lb. as reported from important markets on 11th January 1943 was Rs. 27–4–0 in Calicut, Rs 29–15–0 in Tellicherry and Rs. 33–4–0 in Mangalore. When compared with the prices published in the last report, i. e,. these which prevailed on 15th September 1942, these prices reveal a rise of approximately 22 per cent in Calicut, 30 per cent in Tellicherry and 36 per cent in Mangalore.

Statistics—Cotton—1942-43—Third forecast report The average area under cotton in the Madras Province during the five years ending 1940-41 represents 9 7 per cent of the total area under cotton in India. The area under cotton up to the 25th November 1942 is estimated at 1,931,000 acres. When compared with the area of 2,036,200 acres estimated for the corresponding period of last year, it reveals a decrease of 5·2 per cent.

The estimated area is the same as that of last year in Tanjore and South Kanara. An increase in area is estimated in the Circars (Guntur excepted), Kurnool, Cuddapah, Nellore, Chittoor, Trichinopoly, Ramnad and Malabar and decrease in area in the other districts of the Province. The variations are marked in Kurnool (+50,000 acres), Cuddapah (+11,000 acres), Bellary (–60,000 acres), Anantapur (–17,000 acres), Coimbatore (–28,000 acres), Madura (–26,000 acres) and Tinnevelly (–47,400 acres).

The area under irrigated cotton, mainly cambodia is estimated at 225,900 acres as against 243,700 acres in the corresponding period of last year which represents a decrease of 7·3 per cent.

The yield per acre of the mungari or early sown crop is expected to be below normal in the Deccan on account of drought. The hingari or late sown crop is stunted in growth in parts of the Deccan on account of insufficient rainfall.

Normal yields are expected in all the districts except Vizagapatam, Kistna, Guntur, Kurnool, Bellary, Anantapur, Cuddapah and North Arcot. The seasonal factor for the Province as a whole works out to 90 per cent of the average as against 96 per cent for the corresponding period of the previous year. On this basis, the total yield is estimated at 393,900 bales of 400 lb. lint as against 441,100 bales estimated for the corresponding period of the previous year, representing a decrease of 10·7 per cent. The crop is young and is too early to estimate the yield with accuracy.

The estimated area and yield according to the varieties are given below:—

(Area in hundreds of acres; i. e., 00 being omitted; yield in hundreds of bales of 400 lb lint, i. e, 00 being omitted)

Variety	Area from 1st April to 25th November		Corresponding yield	
	1942	1941	1942	1941
1	2 Acres	3 Acres	4 Bales	5 Bales
Irrigated Cambodia	2159	2357	1350	1474
Dry Cambodia	2714	2716	577	569
Total, Cambodia ...	4873	5073	1927	2043
Uppam in the Central districts ...	191	164	31	27
Nadam and bourbon	340	330	17	17
Total, Salems ...	531	494	48	44
Tinnevellies*	3280	4080	819	1017
White and red northerns ...	1850	1300	185	154
Westerns	7640	8350	765	965
Warangal and Cocanadas ...	1060	1002	186	181
Chinnapati (Short staple) ...	76	63	9	7
Total ...	19310	20362	3939	4411

* Includes Karunganni in Coimbatore, Uppam, Karunganni and mixed country cotton in Madura, Ramnad and Tinnevelly.

Statistics—Cotton—1942-43—Intermediate report Pickings of the mungari or early sown crop in parts of the Deccan are nearing completion and the yield is expected to be below the normal. In parts of the districts of Vizagapatam, Kistna and Guntur and in the Deccan, the crop has been affected by drought to some extent. The condition of the crop is generally satisfactory in the other districts of the Province.

The average wholesale price of cotton lint per imparial maund of 82$\frac{2}{7}$ lb or 3,200 tolas as reported from important markets on 11th January 1943 was Rs. 27—3—0 for Cocanadas, Rs. 30—1—0 for white Northerns, Rs. 23—1—0 for red Northerns, Rs. 27—11—0 for Westerns (mungari), Rs. 25—15—0 for Westerns (Jowari) Rs. 59—8—0 for Coimbatore Cambodia, Rs. 47—2—0 for Coimbatore Karunganni and Rs. 36-12-0 for Nadam cotton. When compared with the prices published in the last report, i. e., those which prevailed on 7th December 1942 the prices reveal a rise of approximately 9 per cent in the case of Westerns, (mungari), 7 per cent in the case of Cocanadas and 4 per cent in the case of Westerns (Jowari) and a fall of approximately 3 per cent in the case of Coimbatore Karunganni and 2 per cent in the case of Nadam cotton, the prices remaining practically stationary in the case of Coimbatore Cambodia and stationary in the case of Northerns (red and white varities).

(Additional Joint Secretary, Board of Revenue, Madras).

Cotton Raw in the Madras Presidency The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February 1942 to 8th January 1943 amounted to 715,070 bales of 400 lb lint as against an estimate of 559,700 bales of the total crop of 1941—42. The receipts in the corresponding period of the previous year were 637,371 bales. 698,168 bales mainly of pressed cotton were received at spinning mills and 2 739 bales were exported by sea while 85,369 bales were imported by sea mainly from Karachi and Bombay.

(Director of Agriculture Madras).

Moffussil News and Notes

Lalgudy An Agricultural Exhibition on a fairly large scale was held at Lalgudy from 8th to 10th January 1943 during the 17th Anniversary celebrations of the Lalgudy Sivagnanam Co-operative Agricultural Society, in the spacious hall of the Local District Board High School. The exhibition was opened in the presence of a distinguished gathering by Rao Sahib G. Rajagopal Pillai, the President of the District Agricultural Association, Trichinopoly. Besides the usual labour-saving implements, the departmental strains of paddy, millets, oil seeds and sugarcane were kept on show. An impetus was given to the "grow more food" campaign and placards concerning it were hung in prominence. Specimen crops of daincha, sunhemp, *pillipesara Kolinji* and indigo were raised in small plots and their importance was explained. A live bee-colony was also put up. A model cattle shed and manure pit were erected. (The Kangayam stud bull maintained by the Society was also stalled nearby).

A special feature of the exhibition was that the local *ryots* brought their own production of paddy, sugarcane, vegetables, fruits and flower plants and the Society awarded silver medals and certificates of merit to the worthy exhibits. The Veterinary, Health and Co-operative Departments and the Hand-loom Weaver's Society, co operated and in the evening cinema films were shown on dairying and lectures with lantern slides were delivered on agriculture, bee-keeping, animal husbandry and epidemic diseases. The exhibition attracted a large number of visitors and it was very much appreciated by them. T. G. A.

Estate News and Notes

Students' tour The students of B. Sc. Ag. class III were taken on a week-end trip to Dindigul and those of class II on a study tour to Mettur, Trichur and Pattambi, during the second fortnight of the month.

Students' Club On the 13th January Dr. G. F. Scudder, District Medical Officer, Coimbatore, delivered an interesting address on 'War time medicine' under the presidentship of Sri V. T. Subbiah Mudaliar

Cyclone Relief Fund A further sum of Rs. 6 was collected and remitted to the Mayor's fund by the students, making up the total contribution to Rs. 212.

Games In connection with the Inter-tutorial competitions the following matches were played during the month. *Cricket*—Sri C. M. John's wards won against Sri Y. G. Krishna Rao's; Sri K. M. Thomas's wards won against Sri C. N. Ayyangar's; *Hockey*—Sri M. C. Cherian's wards won against Sri B. M. Lakshmipathi's; *Foot-ball*—Sri Y. G. Krishna Rao's won over Sri B. M. Lakshmipathi's and Sri C. M. John's won over Sri M. C. Cherian's.

Economic Biologists Association Under the auspices of the Association Rao Bahadur B. Viswanath, C. I. E Director, Imperial Institute of Agricultural Research, New Delhi, delivered an illuminating address on 'What next' on 18th January. The speaker dealt mainly with the importance of agricultural development in post-war reconstruction.

King's Commission We are glad to note that Sri T. K. Mukundan, Farm Manager, Central Farm, has been selected for King's Commission in the Indian Air Force and is proceeding shortly to Ambala for training.

Radha Kalyanam The residents of the Estate celebrated *Radha Kalyanam* with great success on 17th January after the termination of the '*Dhanuramsa Pujas*'.

College Day Sports The thirty first annual athletic sports of the College which could not be held in July 1942, has been arranged to be conducted on Saturday 30th January under the auspices of the Madras Agricultural Students' Union.

Senate Elections We are glad to announce that Sri S. N. Chandrasekhara Ayyar, Lecturer in Botany, is seeking elections to the Senate of the Madras University by the Registered graduates' constituency. He has over 22 years teaching experience and was the Editor of this journal for more than a year. We hope all the registered agricultural graduates will support him with their first preference votes. It is unnecessary to point out the great advantage of having an agricultural man in the Senate, to represent fully the interests of agricultural education.

Grow More Food. The Director of Agriculture convened a conference of some of the District Agricultural Officers at the Agricultural College on the 15th and 16th to discuss the ways and means of growing vegetables on a large scale and production of more food crops. Messrs. Dharmalingam Mudaliar, Kantiraj, M. U. Vellodi. Chokalingam Pillai and Abhishekanatham, District agricultural officers and S. N. Venkatraman, Assistant Marketing Officer were present.

Visitors. The following were the distinguished visitors to the College during the month. Sri P. H. Rama Reddy, Rao Bahadur B. Viswanath, C. I. E., Sir Jogendra Singh, Sri V. C. Vellingiri Gounder. Sri K. Venkataswami Naidu, and Sir Cameron Badenoch, Auditor—general and Chief Commissioner, St. Johns Ambulance Brigades in India.

OBITUARY

We regret to record the death in England of Sir Bryce Burt, who was formerly Agricultural Expert to the Government of India and afterwards for some time Vice Chairman of the Imperial Council of Agricultural Research, New Delhi.

Departmental Notifications.

Gazetted Service.

Posting.

Sri R. Swami Rao, D. A. O. Guntur to be D. A. O. for special duty on Pest Act Work.

Leave.

Sri P. Venkataramiah, Govt. Agricultural Chemist and Principal, Agricultural College, Coimbatore, l. a. p for 1 month from date of relief.

Sri T. S. Ramasubrahmanya Ayyar, Asst, Agricultural Chemist, Coimbatore, extension of l. a. p. for 1 month and 15 days from 16—12—1942.

Sri Samuel Jobitha Raj, D A O. Madura, l. a. p for 4 months from the date of relief.

Subordinate Service.

Appointment.

Sri M. Narasimham, Agricultural Demonstrator, Tenali is posted as a technical assistant in the office of the Director of Agriculture for a period of one year

Transfers.

Name of officer.	From	To
Sri M. Kandaswami	Asst. in Mycology, Coimbatore,	Asst. Tobacco Research Scheme, Guntur.
„ K. Balaji Rao,	A. D. (on leave)	A. D. Rayadrug.
„ S. Mahadeva Ayyar,	A. D. Kodaikanal,	A. D. Thirumangalam.
„ N. S. Rajagopal,	Asst. in Fruits, Pamological Station. Coonoor.	Asst. in Fruits, Fruit Nursery Scheme A. R. S. Taliparamba.
„ P. Narayanan Nayar,	F. M. A. R. S. Taliparamba,	F. M. A. R. S. Nanjanad.
„ K. Gurumurthi,	Asst. Marketing Officer, (on leave)	Special Officer, Tobacco Market Committee, Bezwada.
„ D. Achyutarama Raju,	Special Officer, Tobacco Market Committee, Bezwada,	Marketing Asst., Rajahmundry.
„ J. Suryanarayana,	A. D. Vinukonda,	A. D. Bapatla.

Leave.

Name of officer	Period of leave.
Sri M. Satyanarayana, F. M. A. R. S. Samalkot,	Extension of l. a. p. for 3 months from 27--12--42.
„ K. Ambikacharam, A. D. (on leave),	Extension of l. a. p. on m. c. for 2 months from 7—1—43.
Janab A. Abdul Samad, Asst. in Paddy, Coimbatore,	Earned leave for 60 days from 19-1-43
Sri B. L. Narasimha Murthi, Millet Asst. A. R. S. Anakapalli,	Earned leave for 30 days from 8-1-43.
„ M. Suryanarayana, Asst. in Chemistry, Coimbatore,	Extension of leave on half average pay for 4 months from 27—1—43.
„ P. R. Subramania Ayyar, F. M. A. R. S. Koilpatti,	Extension of l. a. p. for 1 month from 21—12--42.
„ V. Chidambaram Pillai, A. D. Sankarankoil,	L. a. p. for 2 months and 29 days from 20—1—43.
„ P. K. Natesa Ayyar, A. D. Rasipuram,	L. a. p. for 1 month from the date of relief.
„ V. K. Kunhunni Nambiar, A. D. Udamalpet,	L. a. p. for 4 months from the date of relief.
„ K. P. Anantanarayanan, Asst. in Entomology, Coimbatore,	L. a. p. on m. c. for 1 month from 4—1—43.
„ Mayandi Pillai, Cotton Asst. (on leave),	Extension of l. a. p. for 1 month and 6 days from 25—12—42.

The Madras Agricultural Journal

(ORGAN OF THE M. A. S. UNION)

Vol. XXXI FEBRUARY 1943 No. 2.

EDITORIAL

Increasing Rubber Production With the Japanese occupation of Malaya and the Dutch East Indies, which were the peacetime suppliers of about 97 per cent of the world's natural rubber, the United Nations were confronted with a serious rubber shortage as never before. To make up for this staggering deficit and meet the mounting demand for rubber for military and civil needs, the United Nations are straining every nerve to stimulate and augment production of both artificial and natural rubber to the maximum possible extent. The United States of America, Canada and Russia have on hand an all-out programme of production of synthetic rubber. In India a compaign for increasing the production of natural rubber was inaugurated by the Government of India with the constitution of the Indian Rubber Production Board, in November 1942. This body is, as it should be, represented by the Governments of Travancore, Cochin and Madras, the Commerce and Supply Departments of the Government of India and the various rubber producers' organisations. The Board has its headquarters at Kottayam in the Travancore State and Sir C. P. Ramaswami Iyer, the Dewan of Travancore, is the Chairman. The location of the Board in Travancore is much to be commended, as the State claims about 70 per cent of the total Indian production of rubber with 104,465 acres out of an all-India area of 136,606 acres. The Board, according to the Government Memorandum, will "encourage and ensure the increased production of rubber by all possible means through intensification of tapping, new planting, improved methods of manuring and spraying, distribution and maintenance of machinery or estate requisites, propaganda, scientific research, and any other matters that may be necessary." It is gratifying to note that the Board has set itself to the task with notable promptitude and has achieved substantial progress during the short period it has been in existence. Its efforts to popularise the intensive method of tapping by the "double cut half spiral" system which has been found to give substantially higher yields of rubber than the "single half spiral" system and organising the supply of essential estate requisites and rice for the labour working on the estates are sure to whip up immediate production of plantation rubber. The Board is also encouraging new plantations by notifying the availability of suitable lands for planting Hevea and arranging for the supply of budded plants and clonal seeds from reputed estates in India and Ceylon. Permits for new plantations have already been given for about 17,000 acres and it is estimated that the planting of about 50,000 acres will be completed by the

end of 1943. While opinion seems to be divided regarding the advisability of extending the area, as the synthetic rubber industry which is being now developed with feverish haste to meet the essential war needs is likely to compete with natural rubber in post war period, yet the report of the Good Year Tyre Company that synthetic rubbers like 'Buna', 'Ameripol' or 'Neoprene' though possessing elasticity and resilience cannot be universally substituted for the natural product which has a markedly different molecular make-up surpassing all known artificial rubbers in "rebound in severe-service tyre treads", must be assurance enough to the waverers. We hope that the services of the Rubber Production Board will be fully availed of by all planters including small growers who are at present in difficulties in the matter of obtaining proper coagulants and hands trained in the new method of tapping so that the maximum outturn from existing trees is obtained.

Side by side with the drive for enhancing the production of Para *(Hevea braziliensis)* and Ceara *(Manihot Glaziovii)* rubber, the Forest Research Institute at Dehra Dun, the Imperial Agricultural Research Institute at New Delhi and the Agricultural Research Institute at Coimbatore are engaged in the investigation of extracting rubber from other laticiferous plants like the Mexican guayule and the Russian dandelion. In India we have a variety of latex yielding plants growing under different climatic and soil conditions and there is no doubt that a systematic survey and investigation on the possibility of extracting rubber from them will furnish results of considerable value. The investigations conducted by the Botanical and Chemical Sections of the Coimbatore Agricultural Research Institute have shown that we have in *Cryptostegia grandiflora*, of which we published an account in the January issue, a good source of rubber almost equivalent in quality to Para rubber. It is hoped that this study will enable us soon to have complete information on the best method of extracting the latex, quick methods of propagation and other connected matters, so that the present shortage may be immediately met and we may not be in difficulties for the 'tyres' we sorely need.

The Bruhl Medal This medal awarded by the Royal Asiatic Society of Bengal for outstanding work in any branch of Botany has been awarded to Sri Rao Bahadur G. N. Rangaswami Ayyangar, B. A., F. N. I., I. A. S., who recently retired as Geneticist, Millets Specialist and Principal of the Agricultural College and Research Institute, Coimbatore. The previous awards were to the Rev. E. Blatter, I H. Burkill and Sir David Prain. We congratulate Mr. Ayyangar on this signal honour.

The Director of Agriculture, Madras We are glad to learn that the period of service of Mr. P. H. Rama Reddy, I. A. S., Director of Agriculture, Madras has been extended by one year from 16th February 1943. This is to be welcomed as the Department can ill-afford to lose his services at a time when much is expected of it in the matter of increasing the food production in the Province as an integral part of our War effort.

Soil Erosion and Conservation of Moisture in Un-irrigated Black Soils

By A. SUBBA RAO. M. A.. M. Sc., D. Sc., F. Inst. P.
Soil Physicist, Dry Farming Station, Bellary

Lecture No. 2*

The results of run-off experiments conducted at Hagari have shown that a large proportion of the rainfall is lost by surface flow. The greatest opportunity for conserving moisture in dry soils, therefore, lies in the reduction of losses due to surface run-off. It is naturally impossible to prevent run-off completely. If but a portion of it is saved, a substantial increase in the moisture supply is effected.

As mentioned already, in the black soils the main *hingari* crops, cotton and sorghum have to depend on the moisture that is stored in the soil by their sowing time. Rainfall during their growth period is poor and precarious. The effective rainfall for crop growth is that received in the period August to October, normal for August, September and October is 12·3 in. against an annual normal of 20·6 in. (for the last ten years). Conservation methods like bunding, scooping or listing, therefore, help in better utilisation of the rain water. They arrest run-off and allow the water to stand on the field for a longer time, giving greater chance for it to be absorbed by the soil. Ploughing, by throwing the land into better physical condition, helps in better absorption of the rain water by the soil, provided the furrows do not run along the slope. Any implement which cuts a furrow can be used for forming basins, if the furrower can be lifted at intervals. In the case of the basin-lister this is arranged by means of an eccentric cam. The local interculturing implements, *dhantulu* or blade harrows, can also be used for forming the basins by lifting the harrow at intervals.

As moisture is the limiting factor for crop growth in dry areas, a study of its movements under field conditions is essential.

Theoretical Before considering the movements of moisture in soils under field conditions, I shall briefly outline the theoretical aspect of the problem. The earliest hypothesis on the movements of moisture is familiarly known as the capillary tube hypothesis. It is based on the fact that if a capillary tube is dipped in water, the water level inside will be higher than that outside; the rise in the height is given by the equation:

$h = \frac{2T}{gdr}$; where h is the height of meniscus above the water level,

T is the surface tension between water and air,

g is the acceleration due to gravity,

d is the density of the liquid, which may be taken as unity for water, and

r is the radius of the tube.

*Lecture No. 1 published in M. A. J., Vol. 31, pp. 3 -11.

The height of rise is therefore proportional to the inverse of the radius of the tube. If r is very small, then h should be high. If we visualise the soil as consisting of a bundle of capillary tubes of varying cross-sections, r may be taken as the average effective cross-section. If r is very small then water should rise to great heights by capillarity. It follows that the soil between the water table and the water front should be saturated. Varying estimates to which water can rise by capillarity were made by different workers. Their range varies from 10 ft. in a year to about 200 ft. in a favourable term of years. Under laboratory conditions, the rise from a water table never reached these phenomenal heights; it rarely exceeded four feet. This was explained away by the fact that it is impossible to imitate the field structure under laboratory conditions. Dr. B A. Keen in his classical lysimeter experiments showed that the upward rise of water by capillarity occurs over only limited distances. Large cylinders with water-tight bottoms, 2ft. × 6ft, were used for the experiment; their tops were kept a little above the ground level. After the soil was refilled in the natural order, it was allowed to settle for a period of eight years. The level of free water surface was noted in a side tube. From these readings the depth of the free water level was plotted aginst time, during a period of severe drought. The curves obtained by him for the movement of the free water level from an initially saturated soil were very interesting. From these it is concluded that once the water recedes about 80 cm. in clayey soils, it is not drawn back to the surface by capillarity. For all practical purposes upward capillary movement is ineffective even over these limited distances. Dr. B. A. Keen, in a later work came to the conclusion that when water recedes 180 cm or 6 ft. it is not drawn back by evaporation. Dr. V. I. Vaidyanathan, working at the Irrigation Research Institute, Lahore, found that sub-soil water, in the month of June was drawn to the surface by evaporation from a depth of about 22 ft. But the amount thus reaching the surface is a negligible quantity, being 7 mm. for the whole month. This is a very minute fraction of the evaporation losses at the soil surface, much less is it of any use for cultivation. Thus the simple theory of capillarity could not explain the observed phenomena quite satisfactorily. The theory was also applied to the study of the rate at which water moves through soils. In explaining this the fundamental equation for the flow of liquid through a tube under a known pressure head is used:

V, the volume of liquid flowing out in time t, through a tube of length l, under a pressure head h, is given by :

$$V = \frac{\pi g h d t r^4}{8 n l}$$ where r is the radius of the tube, d, the density and n, the viscocity of the liquid.

In the case of downward movement of water, as happens under irrigation or when a rain is received, suppose water is maintained to a constant depth 'a' above a soil column. If we assume that the capillary attraction also assists the forward motion of the liquid through the soil, the total

pressure head at a point distant 'h' from the source is $a+h+k$, where k is the capillary attraction. The rate at which the water front moves can be shown to be:

$$\frac{dh}{dt}=\frac{P}{S}\frac{(a+h+k)}{h}$$

$$=\frac{P}{S}\left(1+\frac{a+k}{h}\right)$$, for the downward motion, P, being the permeability, and S, the pore space.

When h is zero, $\frac{dh}{dt}$ is infinity and when h is infinity, $\frac{dh}{dt}=\frac{P}{S}=$ a constant. Thus in the case of downward movement of water, the rate is infinite in the beginning and tends to become a constant at great heights from the source of water.

In the case of vertically upward motion as happens in the case of the capillary rise from a water table, 'a' disappears and 'k' and 'h' act in opposition. Hence we have:

$$\frac{dh}{dt}=\frac{P}{S}\frac{(k-h)}{h}=\frac{P}{S}\left(\frac{k}{h}-1\right)$$

When 'h' is zero, $\frac{dh}{dt}$ is infinity; and when $h=k$, $\frac{dh}{dt}$ is zero. The velocity of water decreases hyperbolically from infinity to zero at a certain height 'k' from the water table. This shows that $\frac{dh}{dt}$ should vary linearly with $\frac{1}{h}$. From experiments on the vertical rise of water through soils it was found that the expected linear relationship held good only for the first 15 to 20 minutes and there was a progressive decrease in the value of $\frac{dh}{dt}$ over the greater part of the experiment. This demonstrated the insufficiency of the capillary tube hypothesis.

In the case of the horizontal motion of liquid through a soil, 'k' alone acts; 'a' and 'h' disappear; we have $\frac{dh}{dt}=\frac{P}{S}\cdot\frac{k}{h}$ or the velocity is inversely proportional to the height, h.

In a qualitative manner all the above conclusions hold; but they fail to explain quantitatively the movement of water through soils.

When the capillary tube theory failed to explain the phenomena of moisture movements, the analogy of heat conduction and conduction of electricity through solids was applied to the case of movements of water through a porous substance like the soil. This also was not quite successful as the analogy implies that the capillary conductivity or the facility with which water moves through soils should be a constant of the substance, like electrical conductivity or heat conductivity.

It was next realised that a complete picture of the nature of the pore space in a soil was necessary before any correct hypothesis could be postulated. The geometry of the pore space existing in an ideal soil composed of spheres of uniform radius was investigated. The properties of liquid films were applied to moisture films existing round points of contact of the spheres. The pressure below a curved surface of the liquid is less than that above, the deficiency in pressure being given by the product of the surface tension, T and the curvature of the surface $\frac{1}{r}$, r being the radius of curvature of the particle P. D. is proportional to $\frac{T}{r}$. Different pressure deficiencies are associated with different values of $\frac{T}{r}$. The development of the subject is largely due to the work of Versluys, Haines and Fisher. Three stages in the distribution of moisture through the pore spaces of the soil are worked out.

Starting from dryness to saturation, the first one is the 'pendular stage' or the stage of discrete ring formation. As the moisture content is increased, the rings in adjoining cells meet and continuity is established in the moisture within the pore space. The pressure deficiency, which is very high at low moisture contents falls from infinity to $4{\cdot}1\ \frac{T}{r}$, when the upper limit of the pendular stage is reached. This has been determined as 24% of the pore space or 3·55% moisture content by weight of soil. This is the stage when the films within neighbouring cells meet and continuity in the film is established. It is the beginning of the 'funicular stage' of distribution, when the film thickens at the waist. Between 6% and 24% saturation, side by side with the pendular stage, the funicular stage also is possible. The funicular stage extends beyond 24% saturation; its upper limit is not yet determined. As the soil moisture is increased, saturation of the air cells commences, this being the commencement of the 'capillary stage'. In the capillary stage the soil suddenly passes from saturation to flooding. The capillary stage is complete only when all the pore space is filled with water.

At complete saturation the pressure deficiency is zero. But saturation can exist in certain portions of the cells down to a P. D. of $12{\cdot}9\frac{T}{r}$. Between 30% saturation and complete saturation regions of local saturation can exist side by side with regions of low moisture content.

These are some of the salient features of the theoretical studies on the movements of moisture in soils. The subject is still developing.

Experimental Coming to the practical aspect of moisture movements in soils, during the last five years, studies on the seasonal distribution of moisture in soils under field conditions were carried out at Hagari. The relative efficiency of cultural methods intended to conserve rainwater can best be seen only by a study of the moisture condition of the soil at the different depths before and after rainy periods. Soil samples were taken

once a fortnight during the crop period in fields which differ in respect of the preparatory cultivation which they received, like bunding, bunding combined with ploughing once in two years and ploughing once in four years etc. Soil sampling was done by means of King's sampler of the tube type, consisting of a cylindrical brass tube about 6 ft long, having a steel end piece, with a sharp edge and marked every three inches.

Screw augers were not found of much use in these black soils as the soil is lifted in big clods and it is difficult to sample without loss of moisture. Every six inch layer of soil down to 3 feet was sampled and the moisture content for any layer is obtained as the average of about six individual determinations. After the first year, samples were taken for layers 0 to 6 in. 6 to 12 in., 12 to 24 in. and 24 to 36 in. The moisture content of the soil when plotted against the date of sampling gives the curve of seasonal fluctutations of soil moisture for the different layers. Thus the field distribution of moisture is obtained under different experimental conditions—rainfall being the only source of moisture. Figures 1, and 2 contain typical curves for the seasonal variation of soil moisture in a plot cropped with cotton and in one which was fallow. The curves for a plot containing sorghum were almost similar to those of the cotton plot except that they lie a little higher than the corresponding curves for the cotton plot.

The soil reaches its peak of moisture after the September-October rains. All layers reach their field capacity by the end of October. Cotton and sorghum during their growth period depend almost entirely on the moisture stored in the soil at the time of their sowing. During the dry period the amount of moisture lost by the different layers of the soil decreases with increasing depth. The curves for the fallow plot show that evaporation losses are confined practically to the top six inch layer of soil. The effect of the diurnal variations of temperature and circulation of air are a maximum in this layer. The absorption of soil moisture by the crops was effective only to a depth of 2 to 2½ feet, as seen from the differences in the moisture content of the different layers, between the moisture at the end of the rainy period and at the end of the growth period of the crops. The following table contains the differences in moisture content of the soil between 31st October 1935 and 6th March 1936, and shows the amount of moisture lost by the different layers of the soil during the period.

Loss of moisture from the soil during the dry period: (31-10-35 to 6-3-36)

Layer of soil	Cotton plot	Sorghum plot	Fallow
0 to 6 in.	17·5	16·9	14·3
6 to 12 ,,	15·5	15·1	5·9
12 to 18 ,,	13·0	11·2	3·9
18 to 24 ,,	10·6	10·0	2·9
24 to 30 ,,	6·4	6·9	2·8
30 to 36 ,,	1·5	0·5	0·2
0 to 36 in.	10·7	10·1	5·0
0 to 36 in.—in inches	5·1	4·8	2·4

The rate of evaporation being high at high moisture contents, the moisture in the top six inch layer of soil rapidly comes down to the hygroscopic moisture in the course of a few weeks after the rainy period. In the cropped fields the variations of moisture with season in the different layers become almost parallel to each other, losses in moisture gradually diminishing with depth. A clear indication that by fallowing the land moisture is carried over to the succeeding season is provided by the curves in fig. 2, where the moisture below the 12 in. depth was almost constant during the dry period. Curves of soil moisture variations obtained in succeeding years are in general conformity with those given in figures 1 and 2. The moisture in a fallow plot is steady below the 12 in. layer, during the dry period, when the distribution of moisture with depth becomes more and more regular as the dry season advances. It follows an exponential relationship of the type:

$$Y = F - (A.\ b.\ 10^{-ax});$$

where Y is the moisture content at any depth x;

F, the Field capacity (equivalent to the moisture equivalent of the soil);

A, the maximum observed moisture at lower depths;

a and b are constants which can be evaluated from the observed moistures at a few depths.

Calculated and observed values of soil moisture, using the above relationship are given below:

Depth in inches	Observed moisture per cent	Calculated moisture per cent
3	8·1	11·4
9	19·1	19·3
15	25·0	23·9
21	26·8	26·5
27	27·5	28·0
33	27·0	28·8

Considering the variations in moisture which normally exist under field conditions, the agreement between the calculated and the observed values is fairly good.

The moisture content of fields which differ in respect of preparatory cultivation was next studied. The effect of bunding, and bunding combined with deep ploughing was investigated. Scooping by various implements like basin lister, *dhantulu* etc. was also studied in regard to its effect on the conservation of moisture. The curves of moisture distribution similar to those given in figures 1 and 2 have been obtained, extending over different seasons, in an experiment where the treatments are as follows:

(a) Control: preparatory tillage consists of working the *guntaka* or the blade harrow three times before the rainy season;

(b) Bunded;

(c) Bunding combined with deep ploughing by Cooper No. 21 plough, once in two years; and

(d) Bunding combined with deep ploughing once in four years. Ploughing, in these soils is done after the harvest of a cereal. As the rotation is sorghum—cotton, the earliest interval of ploughing is once in two years.

These studies have definitely shown that under the *ryots'* method of cultivation, large quantities of rain water are lost by surface flow without being absorbed by the soil, during the short but heavy period of rainfall, usually September—October It has been shown that ploughing and erection of bunds about 7 in. high help considerably in the absorption of rain water by the soil. From the seasonal curves of moisture it was found that the summer showers are just sufficient to compensate for losses due to evaporation. Although ploughing involves some loss of moisture, all such losses occur in the fallow period when no crop is on the land. With the commencement of the monsoon the ploughed plots are quick to absorb the rain water. Similarly scooping the land by the basin lister or by the local interculturing implements like *danthulu* (blade harrows) has checked erosion and increased the powers of absorption of rain water by the soil. The following are a few typical instances to illustrate the beneficial effects of these cultural treatments on the conservation of rain water, when it is received in heavy instalments.

Trial of Improved Dry Farming Methods

Treatment	Moisture per cent in the layer 0 to 3 ft.		Difference	Rainfall absorbed in inches
	on 16-8-38	on 31-8-38		
(Rainfall between the dates – 6·2 in.)				
Control	18·1	22·1	4·0	1·9
Bunded	19·0	24·1	5·1	2·5
Ploughed once in 2 years and bunded ...	17·2	25·1	7·9	3·8
Ploughed once in 4 years and bunded ...	17·3	26·4	9·1	4·4

Scooping Trials

Treatment	Moisture per cent in the layer 0 to 3 ft.		Difference	Rainfall absorbed in inches
	on 16-8-38	on 1-9-38		
(Rainfall between the dates–6·2 in.)				
Control	15·3	21·2	5·9	2·8
Bunded	15·4	24·8	9·4	4·5
Scooped with basin lister and bunded ...	16·6	26·8	10·2	4·9
Scooped with *danthis* and bunded ...	15·7	26·4	10·7	5·1

The effect of any particular treatment on the absorption of rain water depends also to a large extent on the initial moisture condition of the soil; the drier the soil the greater is its capacity to absorb moisture. The treatments are found to be most effective in checking erosion during the first spell of heavy rains and particularly in years of low rainfall. In years of very good rainfall, however, the effect of the treatments is not so conspicuous in the conservation of rain water, as there is a tendency for the different plots to attain the maximum field capacity; yet there is the lasting benefit of saving the soil, which is otherwise washed off in large quantities as shown by studies on surface run-off.

Figures 3 and 4 contain curves of the seasonal variations of soil moisture, for the first and second foot layers of a control plot, during four years, including a famine year In a famine year like 1937-38, when only 15 in. of rainfall was received the moisture condition of the soil below the first foot was very low; the maximum moisture attained by the second foot layer was 22 per cent during 1937-38, while the corresponding figures for 1936-37, 1938-39 and 1939-40 were 28·3, 28·5 and 28·2 per cent respectively. The available range of moisture which is the difference between the maximum moisture and the wilting point (about 18 per cent) was very low during the famine year. It was found during the course of these studies that the moisture content in the second foot layer has a decisive effect on the yield of crops, which are also influenced by the moisture content of the soil at the sowing time to a large extent.

Percolation of rain water to the lower layers of the soil was found to be very slow due to the heavy nature of the soil and there is consequently a lag in the attainment of moisture by the lower layers. Once the moisture content of any layer reaches about 25 per cent, the percolation to lower layers is improved, due to the continuity of moisture films established within the pore spaces of the soil.

The gradual percolation of rain water to lower layers is illustrated by the figures in the following tables, giving moistures before and after periods of rainfall.

Soil Moisture in a fallow plot, 1935-36

Moisture % on the dates	0 to 1 ft.	1 to 2 ft.	2 to 3 ft.	Rainfall between the dates of sampling	
				Rainfall in inches	No. of rainy days
23-9-35	22·6	22·9	21·4		
4-10-35	29 6	23 5	21·6	2·41	3
14-10-35	24·9	26·3	22·4	0·19	1
31-10-35	27 5	30·6	28·6	3·62	6

Trial of Improved Dry Farming Method, Soil moisture in control plot, 1938-39

Moisture % on the dates	0 to 6 in.	6 to 12 in.	12 to 24 in.	24 to 36 in.	Rainfall between the dates of sampling	
					Rainfall in inches	No. of rainy days
12-7-38	9·4	13·5	15·5	20·7	3·89	6
16-8-38	20·4	15·1	16·5	20 0	6·15	8
31-8-38	21·9	29·2	21·5	19·1		

It is seen that a rainfall of 2·41 in. increased the moisture content of the first foot layer alone by 4th October 1935 and thereafter slowly percolated to the second foot layer and increased the moisture content of that layer only after a lapse of about 10 days. The second instalment of 3·62 inches of rain immediately soaked even to the third foot layer owing to the better conductivity for water at high moisture contents. In the second table it is seen that a rainfall of 3·98 in. received on six rainy days increased the moisture content of mostly the top six inch layer only. The moisture content of this layer was initially very low, being the end of the hot weather period. The next instalment of 6·15 in. of rain enhanced the moisture content of the top two feet of soil.

Towards the end of the crop period, *i. e.*, at the time of harvest of the crops, the moisture in the differently treated plots tends to come to the same level, though the maximum moisture at the end of the rainy period may be different.

Fallowing the land naturally leaves a large reserve of moisture for the succeeding crop, in the lower layers (Vide figure 2). It is seen from the following table how a crop after an year of fallow absorbs the moisture from the third foot layer also, while in plots which are continuously cropped, absorption of moisture is negligible in the third foot layer.

Moisture absorption in plots having a crop after a fallow and having a crop after a crop

Losses in moisture per cent between 15—10—40 and 16—1—41, difference in the moisture content between the dates

	0—6 in.	6—12 in.	12—24 in.	24—36 in.	0—36 in. in inches.
Sorghum (40-41) after cotton	19·4	13·1	12 2	2 1	4·90
Sorghum (40-41) after fallow	21·1	14·2	11·5	10·1	6·29
Fallow (40-41) after sorghum	18 3	2·6	1 7	1·0	1·92

The extra moisture is utilised in the production of additional dry matter in the plots after fallow. In view of the uncertainty of the seasons, however, fallowing of a large area cannot be recommended to the cultivators.

Fallowing a small proportion of the holding as an insurance against famine is feasible.

Indirect influence of conservation of water (a) Conservation of moisture reduces the shrinkage and consequently the amount of cracking during the period of crop growth. It has already been mentioned that clayey soils swell when wet and shrink very much on drying. The changes in the volume of the soil due to wetting and drying are large and with the advance of the dry season numerous cracks are formed. It was found that the black soil of Hagari has a shrinkage coefficient of about 65% by volume, when passed through a sieve of 100 mesh to the inch; *i. e.* when 165 c. ft of soil are dried from sticky point (about 40 per cent moisture) to dryness, the volume will be reduced to about 100 c. ft. In the field the shrinkage will naturally be less than this owing to the presence of coarse particles and as the range of moisture the soil has to pass through in one season is limited. If, however, we can succeed in reducing the desiccation of the soil during crop growth, the shrinkage will be less and there is less possibility of wide cracks developing during the crop period.

(b) A second and more interesting effect of conservation of moisture in heavy soils is that on soil hardness. Losses of soil moisture by evaporation have been shown to be most effective in the top 12 in. layer of soil. This layer, after reaching the maximum field capacity for moisture during the rainy period, is subjected to sudden drying thereafter. The layer of soil between 3 to 12 in. thus becomes very hard, if the desiccation is rapid—the top 3 in. of soil remaining in a loose and friable condition, being disturbed by interculturing and exposed to alternate heating and cooling, on account of the diurnal fluctuations of temperature. If the hardness sets in later in the life of the plant, when it has established itself well, it may not affect the crop growth; but, if by adverse conditions, the hardness sets in early, the crop suffers on this account badly. By conserving moisture, the setting in of the hard layer may be postponed to a stage when it is of no consequence to the growth of the plant.

In this lecture, I have placed before you certain facts in regard to the movements and conservation of moisture in black soils, which have emerged as a result of the studies conducted during the last six years at Hagari.

Before concluding I wish to record my grateful thanks to the University of Madras for inviting me to deliver "The Maharajah of Travancore Curzon (Endowment) Lecture" in agriculture this year. My thanks are due to the Imperial Council of Agricultural Research, which is financing the Dry Farming Scheme at Hagari, jointly with the Local Government. I must record my grateful thanks to Mr P. H. Rama Reddy, I. A. S., the Director of Agriculture and to Mr. P. V. Ramiah, M. A., B. Sc. (Edin.), Government Agricultural Chemist, for their continued interest in the work. My thanks are also due to the Superintendent, Dry Farming Station, Hagari, for the

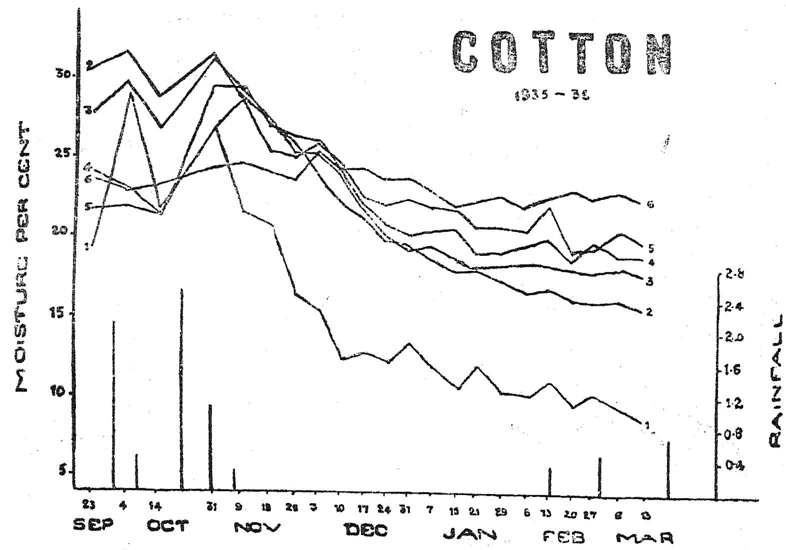


Fig. 1. Soil Moisture curves in a Cotton plot.

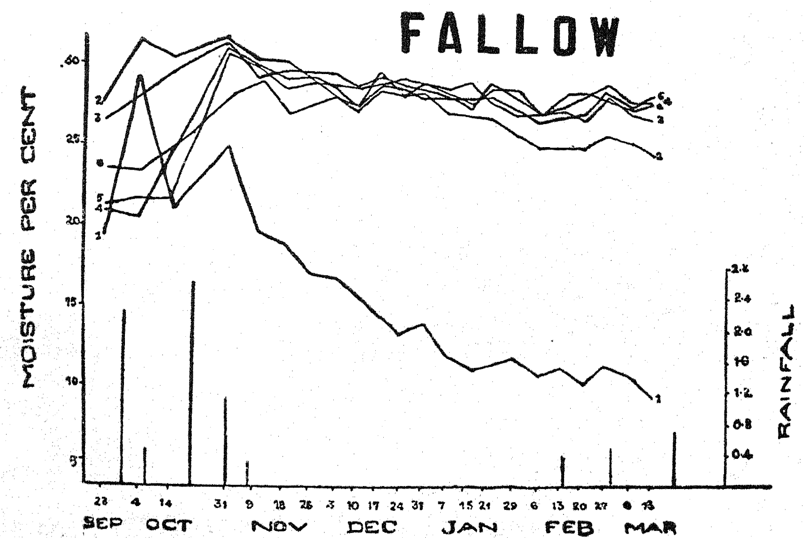


Fig. 2. Soil Moisture curves in a Fallow plot.

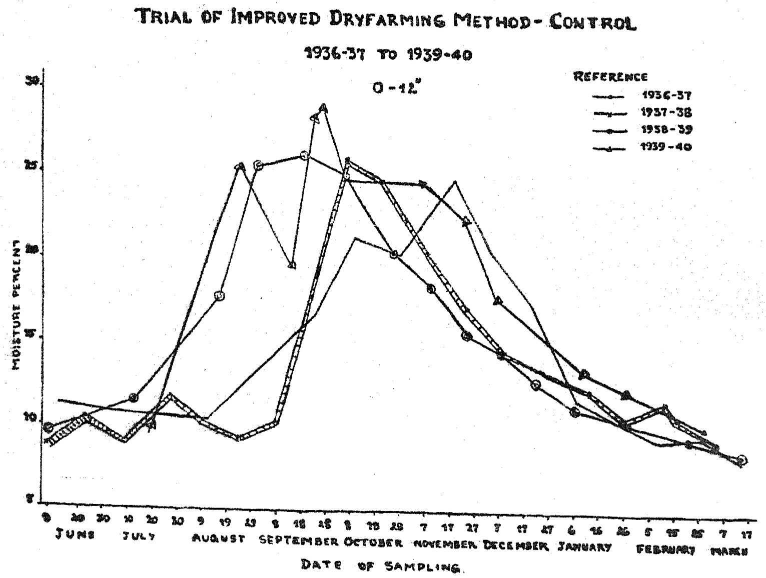


Fig. 3. Soil Moisture curves for four years for the first foot layer. (Double line ; Famine year).

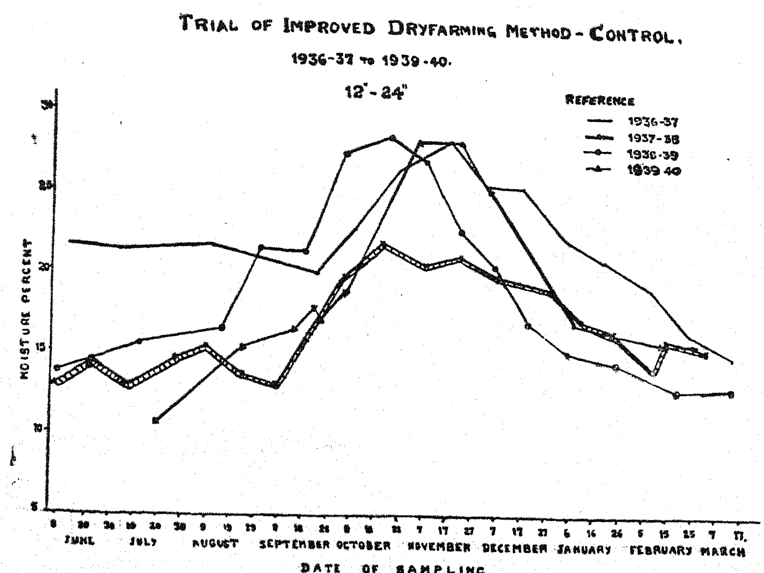


Fig. 4. Soil Moisture curves for four years for the second foot layer. (Doule line ; Famine year).

agronomic work done in these experiments to my staff who assisted me in the collection of the data, to Mr. T. R. Narayanan, for valuable help in taking the pictures for epidioscopic projection and to Mr. T. Natarajan for help in projecting the pictures during the lectures. Finally I have to thank Mr. R. C Broadfoot, I. A. S., Principal of the Agricultural College, for kindly making arrangements for the lectures, besides presiding over the same.

References:

1. Dudley Stamp L. Soil Conservation in Tropical Africa. *Nature* 141, 268.
2. Gorrie, R. M. (1935). The use and misuse of Land. *Oxford University Forestry Memoirs*, No 19.
3. Jacks and White. Rape of the Earth.
4. Keen, B. A. *The Physical Properties of the soil.*
5. Russel, E. J. *Soil conditions and plant growth.*
6. Watson, G. S. *Soil and Social reclamation.*
7. *Agri. Exp. Sta Rep. Texas* 1927 and 1928
8. Towards Soil Security. *Fmrs' Bull. 1864. U. S. Dep. Agric*

A cheap process of preparing charcoal for activated carbon

By M. ANANDAN, L.Ag.,

Deputy Director of Agriculture, Central Division, Chittoor

and

K. RAGUNATHA REDDY, B. Sc (Ag)

Marketing Assistant, Chittoor

In the manufacture of activated carbon from paddy husk, as carried on at present, the ignition of the first char at high temperature is done in thick iron tubes about 4 ft in length and 8 in in diameter. These tubes, to make them fairly airtight, have to be provided with lids hinged to both ends. Such iron pipes at the present market rate will cost anything from Rs. 30 to Rs. 40 each and even at that high cost are not easily obtainable. As these iron pipes have to be subjected to very high temperature, each time a charge of carbon is ignited they get fire-eaten after 50 to 60 charges and have therefore to be discarded, and new ones substituted. And for the ignition of carbon in such tubes under high temperature it is also necessary to build elaborate and costly furnaces with brick in-mud with the provision of iron gratings, ash pit, etc. To build a furnace of the kind designed by the Government Agricultural Chemist to take in three iron tubes of the dimensions mentioned above, it costs roughly Rs. 130. Because of such high cost and intricacy of building such furnaces, it is not possible for the majority of cane growers to prepare their own carbon to clarify their cane juice.

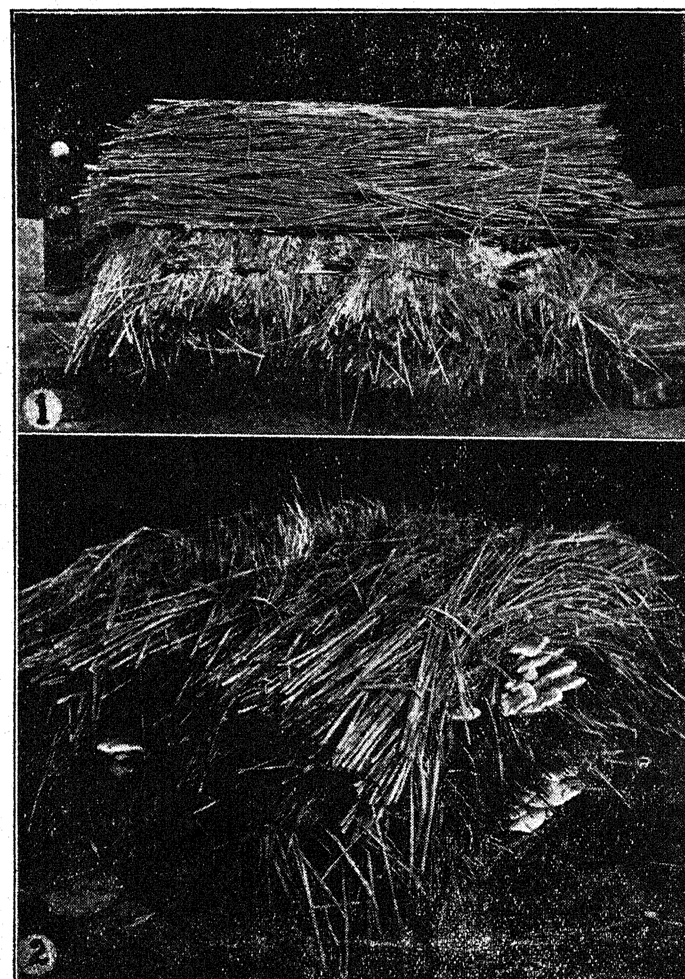
The new simplified method. With a view to simplify and cheapen the process of carbon making and to eliminate iron tubes and elaborate

furnaces altogether. the authors tried to find out whether it will not be possible to carry out the ignition of the first char in narrow mouthed earthern pots commonly made and sold by the village potter at an anna each. In the trial conducted a well-burnt earthern pot of about 4 gal. capacity and with a narrow mouth 4 in. in diameter was used. The first char was prepared by the usual process of burning the paddy husk in the open. This first char after cooling was filled in the mud pot and the pot was kept in a shallow pit of about 4 in. in depth. It was then covered with well-dried cow-dung cakes and ignited. Within a few minutes the pot became red hot and the carbon inside began to glow. The ignition was kept up and continued for about 45 minutes before emptying the contents on to a clean floor or cooling. The weight of ignited carbon obtained from each charge was roughly 10 lb. The weight of cow-dung cakes used for each charge was also 10 lb., costing nine pies. The mud pot stood high temperature remarkably well, indeed. There was not the slightest damage to it and it looked that it could be used for igniting several charges of carbon. Even if the pot were to get broken in handling, the replacement charges are so low as to be negligible. Assuming that a pot could be used for igniting a dozen charges and the fuel for each charge of 10 lb. of carbon costs 9 ps., the cost of production of a pound of ignited carbon will work out at a pie a pound. Though cow-dung cakes were used in this experiment as fuel, it does not mean that other kinds of fuel like charcoal and even ordinary firewood could not be used for ignition. It might even be possible to surround the pot with a thick layer of pre-heated paddy husk for igniting the first char. In that case it may be possible to utilise the heat produced in the manufacture of the first char from the paddy husk itself for the ignition of the carbon in the mud pot. In that case the cost of cow-dung cake or other kinds of fuel could also be eliminated.

A sample of carbon prepared by the new method was sent to the Government Agricultural Chemist for treating with caustic soda for activating it, and for his opinion. His opinion was as follows: "The sample of paddy husk charcoal received from you with the letter read above was activated and found to be suitable for the manufacture of activated carbon. The resulting carbon clarifies sugar juices well."

The results of this trial indicate the possibility of preparing active carbon without the use of costly iron pipes and elaborate furnaces. For large scale manufacture of carbon, one will have to use bigger sized pots and a battery of them, according to the demand for carbon. If costly caustic soda could also be replaced by cheaper alkalies for treating the carbon, the use of activated carbon as a clarifying agent is sure to become very popular, not only in the manufacture of cream jaggery and sugar, but also in clarifying vegetable oils, etc.

Paddy Straw Mushroom.



1. Spawning the bed.
2. Mushrooms appearing after 15 days.

Paddy Straw Mushroom

By

K. M. THOMAS,

Government Mycologist,

T. S. RAMAKRISHNAN & I. L. NARASIMHALU,

Mycology Section, Agricultural Research Institute, Coimbatore

Mushrooms represent the spore-bearing (reproductive) portions of a group of fungi, coming above ground. The vegetative portion consisting of a system (or mycelium) of thread like branched structures called the 'spawn' remains underground. Mushrooms are of various shapes, sizes and colours. Some of these are edible and can be made into delicious dishes. But there are many which are poisonous and if any of these species are unwittingly consumed, it may lead to fatal consequences. Edible mushrooms are cultivated on a large scale in Europe and America. *Psalliota campestris* is the species that is grown in most of these countries. The cultivation of this mushroom is a specialised art But this species grows only in cool places with temperature below 70°F. As such it is not possible to grow this species on the plains districts of our province.

In various parts of our province several species of mushrooms come up during the rains or in the cooler months (October—December). These are gathered and used by village folk or offered for sale. But these are available only for a short period and only experienced people can differentiate between edible and poisonous mushrooms.

In Burma and Malaya, a mushroom *(Volvaria diplasia)* known as the 'paddy straw mushroom' is cultivated. As the name implies this is usually grown on paddy straw. It is possible that the same mushroom may be seen coming up in the hay stacks in Malabar during the rainy months but no attempt at regular cultivation of this or other species is evident in our province.

Pure cultures and a bottle of spawn of *Volvaria diplasia* were obtained through the kind courtesy of the Mycologist to the Government of Burma and with these attempts were made to cultivate the fungus at Coimbatore. These were very successful.

The method of cultivation is as follows: To start with, there must be good paddy straw available in sufficient quantities. It would be more convenient if the straw is in bundles (sheaves as made during harvest) each bundle being 8 to 10 in. thick at the base and 3 to 4 ft. in length. A shaded place well protected from winds is selected. A corner in a back verandah protected by screens will serve the purpose. The flooring must be well drained. A cement floor, or a slightly raised platform made of bricks or planks may be used. The straw bundles that are to be used must first be steeped in water for 24 hours. To prepare the bed, one layer of

straw bundles is first laid on the floor. This layer will be 8–10 in in thickness and must be uniform. The bundles of straw are usually thicker at the base and smaller at the other end. Uniformity of thickness can be obtained by placing 4 or 5 bundles side by side with the base pointing in one direction. Over this an equal number of bundles is placed with the bases on the opposite side. Both these sets together form one layer of straw of uniform thickness. Bits of the pure spawn grown in a bottle are placed over this layer all round the bed 4 to 5 in. from the edge. Each bit is about an inch or 1½ in in thickness. The bed is then sprinkled with a handful of *dhal* powder. Next the second layer of straw bundles is placed over the first, these bundles being placed across those of the first. The bed is then drenched with water applied through a rose can. Bits of spawn are placed over this layer all round about 4 to 5 in. from the edge and *dhal* powder, sprinkled (as over the first layer). A third layer is formed over the second, the bundles being placed across those of the second layer. Water is applied over this by the rose can. Bits of spawn are now spread all over the third layer and not merely round the margin. Again *dhal* powder is sprinkled all over the surface. This is covered by a fourth and last layer of straw bundles placed across the third layer. The straw is pressed down and compacted and water is poured over the topmost layer by means of a rose can. The entire bed will form almost a cube 3½ to 4 ft. on each side. A bed of this size can be easily attended to from all sides. The bed has to be watered once or twice a day according to the weather conditions. Too much water should not be applied but the bed must be kept always moist. Mushrooms appear in 15 to 20 days after spawning. These come out in clusters from the sides of the lower layers and from the top. A few mushrooms develop on the first day. The largest number is formed on the second or third day. Usually mushroom formation ceases after the fifth or sixth day. Sometimes a second crop develops from the same bed a week later. But this crop is poor.

The yield from one bed of the aforementioned dimensions varies from 6 to 10 lb of mushroom during favourable seasons. The results of monthly spawning carried out last year show that the heaviest crops are produced in June—July. Fairly good crops are obtained in April, May and August. In March and September few mushrooms develop. During the other months mushrooms are not formed under Coimbatore conditions.

The spawn that is used is a pure culture of the fungus grown on chopped straw in ordinary narrow mouthed bazar bottles. The bottles are filled with chopped straw. Then plenty of water is poured in and the bottle allowed to stand for 24 hours. Then the excess water is drained off, the bottle is plugged with cotton wool and sterilised by autoclaving at 15 lb. pressure for 2 hours. After sterilisation the bottle is inoculated with a bit of the pure culture of the fungus. The latter grows on the straw in the bottle and in 3 to 4 weeks extends completely throughout the bottle and the spawn is ready for use. One bottle is sufficient for one bed but with

two bottles per bed, the yield is better. The spawn is taken out by breaking the bottle. It will be more or less a compact mass of straw and fungus mycelium. This mass is cut into small pieces and used for spawning.

It is advantageous to use the bottle spawn which can be had from the Government Mycologist, Agricultural Research Institute, Lawley Road P. O, Coimbatore In Malaya it is reported that the straw from the bed which had borne a crop of mushrooms is used as spawn for inoculating a new bed. But at Coimbatore this method was not successful.

The cultivation of this mushroom is possible for six months in the year. Since it comes up well only during the warmer months its cultivation can be attempted in the plains tract of cur province. It grows in places where the temperature is above 75°F. It is very tasty and delicious. Fresh straw gives a better yield than old straw from hay stacks.

This mushroom is fairly big with a cap 4 to 5 in. in diameter. The cap is dark grey on the top and slightly raised (umbonate) in the centre. The stalk is white 2 to 4 in. in length. At the base of the stalk is a prominent dark grey cup-like structure (volva) from which the fungus receives its name. There is no ring (annulus) on the stalk. The gills are light flesh coloured when fresh.

Our thanks are due to Mr. U. Thet Su for kindly supplying the pure culture of the fungus.

Ref.:- Thet Su, U. and Seth, L. N. *Ind. Farm*, Vol. I, 332, 1940.

SELECTED ARTICLE

The Wealth of India

India is a subcontinent of Asia shaped like a battered triangle, the northern part entirely landlocked and the southern bounded on the west and east by the Indian Ocean and the Bay of Bengal, respectively. The base of the triangle stretches eastward from the Iranian border to the western frontier of Burma, over which the Japanese now stand guard. From north to south, India is 2,000 miles long and from east to west 2,500 miles wide. The total area is estimated at 1,578 000 square miles.

Into this area which is about half the size of the United States there is crowded a population estimated in 1941 at 389 millions. It is a fast growing population, as indicated by an increase of some 60 millions in the past two decades In any evaluation of the material wealth of India the population factor is of great importance. A mere enumeration of the country's wealth in terms of agricultural and mineral resources makes for very impressive reading, but it is considerably less so when the resources are related to the needs of so huge a population.

The wealth of India is essentially agricultural. Much has been said in recent years about the industrialization of India, but the fact is that now—more so than in the past—the country is predominantly rural. It has been estimated that agriculture provides, directly or indirectly, the livelihood of 89 per cent of the people. The remainder derive their income from industry, which has failed to

absorb any of the excess agricultural population. Indeed, the proportion of farm population to the total increased from 61 in 1891 to 73 in 1931. This is the reverse of the process taking place in the Western World and in the economically more progressive countries of the East and it thereby underlines the importance of agriculture in India's economy.

The agricultural resources of India consist of some 320 million acres of cultivated land. Inasmuch as the problem of securing adequate food supplies for India's 400 millions is the most significant, four-fifths, or 250 million acres, of all the cultivated land is under food crops ; the remainder is devoted to industrial or cash crops.

Rice is the most essential food crop of India. The diet of approximately 70 per cent of the population consists mainly of rice. India has the world's largest acreage under rice (72 million acres) and is second only to China as a rice producer (57 million pounds). These figures are formidable indeed, but it must be noted that in the past two decades output actually declined by 8 per cent as against an 18 per cent rise in population The decline in output is caused by stationary or slowly declining yields. The average yield per acre in the past two decades ranged from 29 bushels (1922-26) to 26 bushels (1937-41) as against 68 and 75 bushels in Japan. India, therefore, does not produce enough rice to satisfy its requirements, and the per capita consumption has declined from 205 to 162 pounds. Even on this basis of reduced consumption India must import from 6 to 8 per cent of its total rice supply from Burma. With the Japanese occupation of Burma, India's rice supply situation has been weakened still further.

Wheat is India's second important crop, the area averaging 35 million acres and output about 375 million bushels. As in the case of rice, in recent years there has been little increase in acreage and output of wheat. The per capita consumption (60 pounds) has remained practically unchanged, but mainly through diversion of what was formerly an exportable surplus into domestic channels of consumption.

In addition to the two premier crops, India is a large producer of a variety of millets (more than 60 million acres), barley, corn, and legumes. India is the world's greatest sugarcane producer. There are nearly 4 million acres under sugarcane, with an output of 5 million tons of sugar, but of low quality. In terms of volume, India is the world's largest tobacco producer, with 1,497,000 acres growing 1,375 million pounds

Another important source of India's agricultural wealth is its livestock which including sheep and goats, is estimated at 310 million head. Because of the many and indispensable functions assigned to livestock by Indian peasants–"the cow and the bullock have on their patient back the whole structure of Indian agriculture"–their economy is dependent upon the quality of this livestock. The fact is, however, that the livestock is of a poor quality indeed, it is small sized, inefficient, and subject to many contagious diseases. The gradual expansion of the cultivated area at the expense of pastures in the congested areas of India has adversely affected animal husbandry. It is contended that the fodder available in India is sufficient for only two-fifths of the livestock. The large number of livestock in India places the country in the position of the world's leading producer of hides and skins, both raw and half tanned. The output is estimated at 20 million cattle and almost 6 million buffalo hides, 28 million goat and kid skins, and 19 million sheep and lamb skins.

India is one of the largest producers of oilseeds, oil cakes, and oils, having planted an area of 23 million acres under a variety of oil-bearing seeds. Chief among these is a yearly output of 3 million tons of peanuts, and a yearly output

of 340,000 tons of pea-nut oil. Linseed, castor-beans, rapeseed and sesamum are the other important oilseeds. Approximately a million tons of oil extracted from these seeds is exported. India is perhaps the original home of the cotton plant and has been for many years the second largest cotton producer, with an output of 4·5 million bales per year. Despite attempts to develop substitute materials, jute continues to be the cheapest packing cloth in the world. In this field India enjoys the virtual monopoly, based on an annual output of 9 million bales.

Despite the agricultural character of India, it differs considerably from such agricultural countries as the Netherlands Indies and Malaya. This is because of India's variety of mineral resources, not possessed by the other two countries. India represents a vast potential industrial area, with an abundant labor supply and unlimited market; but these very factors, associated with low spendable income, inefficiency of labour, lack of capital and reluctance on the part of the colonial administration to encourage heavy industries, have so far handicapped the country's industrial development. Yet India has large resources upon which industrialization could feed itself, once the handicaps are lessened or eliminated altogether.

India's mineral resources include enormous easily accessible supplies of high grade iron ore. The reserves are estimated at 3 million tons, and iron content of the ore averages 64 per cent. Coal, cooking coal, and manganese—all basic materials in iron and steel making—are available in abundance. Estimates of the coal resources vary from 36 to 60 billion tons, of which 5 billion tons is of good quality and easily workable. After Russia, India is the largest producer (over 1 million tons) of high grade manganese. The country is the world's largest producer of mica, the other chief producers being the United States and Canada. India's proportion, by value, of the total output of these three countries is over 80 per cent India is one of the world's important producers of chromites, an essential mineral used in the manufacture of stainless steel and of chromesteel for armor plate for warships. Bauxite deposits of considerable extent and of good quality for the manufacture of aluminum, as well as large potential hydroelectric power, must be added to the non-agricultural resources of India.

By far the greater part of the mineral wealth of India is yet in the making. There is altogether too great a gap between the mineral resources of India and their actual utilization. With few exceptions, notably that of the cotton textile industry, India's Industrial development has proceeded at an extremely slow pace. In 1934–38 India mined only 24 million tons of coal annually, 2½ million tons of iron ore, 339,000 tons of copper ore and 8,000 tons of bauxite, while the value of the entire mineral output averaged 65 million dollars. Even under the stimulus of war production India's output of finished steel in 1941 amounted to only 1,250,000 tons.

It is unquestionable, however, that the enormous wartime demands that rise daily have created an urgent need for intensified industrial development of India. It involves also a basic and positive change in the attitude of Great Britain regarding a rapid industrialization of India. This, in conjunction with the material and technical aid received from the United States, may find India in a position to translate at an accelerated rate the country's potential resources into actual wealth.

Such a development is all the more important because not all is well with India's agriculture, now its principal source of wealth. The fact cannot be overlooked that the 320 million acres of cultivated land do not provide all the people with a quantity—let alone quality—of food necessary to meet the

minimum requirements of the unpretentious diet prevailing in the Far East or south-eastern Asia.

There is nothing inherent in an Indian peasant that prevents him from becoming an efficient producer of food and other farm products and from realizing all the benefits that follow. But the institutional milieu within which the peasant lives and works militates against such changes. Lack of education, very limited application of agricultural science, and a land-tenure system that burdens tens of millions of Indian peasants, inheritance laws that result in fragmentation of holdings and, what is perhaps most important, a rapid increase in population pressing ever harder against the available resources - all these combine to make output low, both per unit of land and per man. The net result is not enough agricultural wealth to go around, which in practice spells widespread poverty and disease.

No progress in agriculture or in industrialization can appreciably increase the wealth of the people if the growth of population in India continues at the rate of the past two decades, nullifying whatever material advantage is gained. It is well to remember in this connection the conclusion reached by the Royal Commission on Agriculture in India that everything "which we have advocated for the material advancement of the people will merely postpone the effects of the growing pressure of the population on the soil. No lasting improvement in the standard of living of the great mass of the population can possibly be attained if every enhancement in the purchasing power of the cultivator is to be followed by a proportionate increase of the population." W Ladejinsky, Office of Foreign Agricultural Relations (*Agric. Situation, U S A, August 1942)*

The Cultivation of Rubber, *Hevea brasiliensis*, in India

Until about the year 1895 rubber was a forest product obtained chiefly from wild trees in Brazil. Rubber was also obtained from *Ficus elastica* trees growing wild in Assam as early as 1880. By about 1914 *Hevea brasiliensis* had practically eliminated all other kinds of raw rubber from the market. The introduction of this tree into the East from its natural home in the Amazon valley became successful by the fortunate survival of 2000 seedlings despatched from Kew to Ceylon in 1877, out of a total number of 70,000 seeds brought from Brazil to Kew by Wickham in 1876. The first plantation in India of the Hevea trees appears to have been in Poonoor Estate in S. Malabar in about 1900 and the next in Travancore in Periyar Estate in Thattakad. By 1924 the total area under rubber cultivation in India rose to about 71,500 acres. The rubber cultivated area in India as at 30th June 1942 was 136,606 acres of which 104,465 acres were in the Travancore State.

The invention of the pneumatic tyre has been largely responsible for the rapid growth of the plantation rubber industry. It has been estimated that in 1941 the total exports of plantation and wild rubber from all producing countries amounted to 1,560 000 tons.

The price of rubber in 1910 touched 12 sh 9 d. per lb. The rush to plant resulted in over-production. In 1922 the price fell to 6¾ d. per lb. After recovering during the operation of the Stevenson Scheme when 4 sh. 8 d. was reached in 1925, it fell in early 1930 to less than 2 d. per lb. Since the introduction of the International Rubber Regulation Scheme the price of rubber has not fallen below 6 d. per lb. It has recently been fixed at round about 1 sh. per lb.

Hevea is a quick growing, tall, erect tree of the family Euphorbiaceae. It thrives up to an altitude of 1500 ft. but above this the trees are less vigorous, smaller and produce less rubber. It prefers good, stiff loamy soil with sub-soil

drainage, but it grows well on peat or clay, on alluvial soils and even on hard gravelly soils. A rainfall of 80 to 100 inches per year is good for the rubber tree It cannot tolerate salt and so will not grow on land liable to flooding with sea water. The tree is not generally fit to tap until five or six years after planting.

In planting an estate from jungle land or replanting areas where old rubber trees are to be replaced by better ones, the land selected is felled and burnt. The usual practice was to allow the timber and debris to become well dried in order to obtain a complete burn. The present tendency is to give only a light burn, so that the scrub jungle and the smaller timber alone are burnt while most of the heavier timber remains. A light burn causes less destruction to the humus in the surface soil and leaves more seeds and roots of indigenous plants capable of rapid new growth. Soil erosion following clearing up of the jungle, is thus prevented to some extent and the timber is useful for an year or two in helping to build up bunds and terraces.

After the land has been cleared, lined, terraced or bunded, drained and silt pitted, planting holes are dug. The number of planting holes or pits may vary from 180 to 250 per acre. This may be increased to 300 per acre for obtaining a higher crop during the first few years of tapping and then thinning down to the required number. The holes are filled before the planting season with surface soil and any manure available. Three to four seeds are placed in the pit to safeguard against loss in germination and until successful budding, and covered up with a small amount of soil. Seeds may be germinated in special beds, planted in nurseries and when the seedlings have reached an year's growth or even more they may be planted in pits in the field. Basket plants may also be used for such planting. In the meanwhile the whole area is planted with suitable cover crops to prevent soil erosion and to provide humus for the soil.

Rubber trees grown from ordinary seed yield variable quantities of rubber, the average in South India being about 300 lb. per acre per annum on well managed estates. To increase the production of rubber various methods are employed. Manuring with suitable mixtures and spraying against leaf-fall disease give good results. By the selection of high-yielding mother trees and by vegetative propagation, *e. g.*, by bud-grafting, a large number of clones of high yield has been established. The production of clove seedlings, that is, seed produced from the cross-fertilisation of one or more proved cloves was recognised early as one of the most valuable results which would be secured from budding. Budgrafted areas are now giving almost four times the yield of ordinary seedling areas. While clonal seed areas give yields fully equal to that of the parent clones, there is the added advantage of no loss of time through budding nor doubts about renewal of bark or any other disadvantages likely to be observed in budded areas.

The budwood is obtained from nurseries planted for this purpose. It is cut up into lengths of about a yard and from each length about 12 to 15 buds can be obtained. The dormant buds are sliced off with a sharp knife giving chips of bark with the bud in the middle and with a thin layer of wood still on the inside. The stocks, that is, the plants which are to be budded should have a diameter of not less than one inch at the base which represents about an year's growth. A narrow flap of bark is detached from the stock at the base by making two vertical cuts and one across the top or preferably at the bottom during the rainy season. This flap is pulled outwards exposing the outside of the cambium or growing layer. The bud patch is then trimmed to a width and length slightly less than that of the exposed cambium on the stock and after the thin layer of wood is gently pulled out with the teeth, it is carefully placed under the flap of bark on the stock, so that the living cambium of the patch and that of the stock are in contact. The flap is placed in position and the whole is then tightly

bound up with waxed cloth. An expert budder could bud 200 to 250 plants per 7-hour day in the field, or 250 to 300 in the nursery. After two or three weeks the binding is opened up. The flap of bark is pulled away and the bark of the bud patch gently scraped to see if it is still green which indicates that the budding has been successful and that the bud patch is alive and in organic union with the stock. A good budder could get 90% success. Failures are re-budded. The stock is then cut off a few inches above the budding, which causes the bud to shoot. Although budding in the nursery saves time, budding in the field may be more suitable where weather conditions are uncertain.

Rubber latex is obtained by making an incision in the bark to open out the latex containing cells. The common tapping knife used in South India is the Michil Golledge type designed to remove a thin shaving of bark leaving a surface sloping inwards slightly towards the tree to prevent the latex from overflowing down the bark. After the cut is made the white milky latex exudes from the freshly cut surface and flows down the cut towards the spout—a piece of bent galvanised iron embedded into the bark and it drips from the cut into the cup. The usual system in S. India of tapping large trees is the "half-spiral alternate day system". Recently the "double half-cut, once in three days system," with rest from the beginning of February to middle of March and again during at least two months of the monsoon period beginning from 15th June to 15th August on four estates gave the following increases :—

	Results of "half-spiral alternate day" tapping (lb. per acre)	Results of "double-cut half-spiral once in three days with rest" as above-mentioned (lb. per acre)
Estate No. 1	430	525
" 2	389	495
" 3	430	525
" 4	525	540

These figures definitely indicate that this system could produce better results than the "half-spiral alternate day" system at least during the present emergency period.

Latex preserved with ammonia gas has a ready market. For making smoked sheet, the latex is strained to remove dirt and it is then poured into a large bulking tank, diluted with water to a half or less of its natural rubber content, thoroughly mixed and rubber content checked by a hydrometer in order to know how much acid has to be added to it for proper coagulation. One fluid oz. of acetic acid to 11 lb. of rubber or one fluid oz. of Formic acid to 18 lb. of rubber is added for coagulation of latex by the following day. Larger quantities in proportion are added if sheet is to be made the same day. Before adding any acid it has to be diluted with water. The diluted latex, after the addition of the necessary quantity of diluted acid, is poured into aluminium pans or into tanks with aluminium or wooden plank divisions of proper size so that on coagulation it forms into slabs of coagulum. Such slabs are removed from the coagulating pans and washed in water and after being lightly pressed by hand to remove the water they are passed three or four times through a smooth roller and then through a criss-cross or ribbed marking roller to turn out the sheet with a diamond pattern or ribbed marking. These sheets are then hung on racks in the shade for a few hours to drip and are then carried to a smoke house for drying in the heat and smoke of burning firewood. In a modern smoke house it takes only about four days to smoke and dry the sheet completely. A well smoked sheet is translucent, brownish or dark amber in colour without any opaque patches. In the packing shed each sheet is examined against the light and any

obvious pieces of dirt are cut out. Rubber sheets are then sorted into various grades and packed in bales covered with jute hessien, each bale containing 224 lb. nett. Such bales are stencilled with nett and gross weights, grade, estate name, etc. and despatched for sale in the market. P. Kurian John (*Travancore Information*).

Hints for Bee-keepers

For March

Favourable factors for the prosperous working of the colonies exist during this month also. *Peltophorum*, maize and palmyrah are in full bloom and these afford a plentiful supply of pollen. Cambodia cotton, wood apple, *margosa*, rain tree, and *pungam* constitute the main sources of nectar. Of these, neem and wood apple are particularly favoured by the bees since numbers of them can be found humming round their flowers. *Pungam* is reported to be a very good source of nectar also. The environments continue to be favourable for the bees and as such the hints already given regarding provision of additional space for breeding and honey storing, swarm prevention etc. must be borne in mind. As most of the colonies are expected to be in yielding condition during the month the following hints on the extraction and preservation of honey will be useful.

The bee keeper has to wait until the honey in the comb is in a fit condition to be extracted. It is a well known fact that bees convert the nectar which they collect from flowers into honey within their stomach, and regurgitate it into the cells. This honey contains superfluous quantity of moisture which would spoil its quality in course of time. This is therefore promptly eliminated by the bees and the cells are sealed with wax. The honey at this stage is called "ripe" and for the reasons mentioned above combs having about 75% of the cells sealed are to be taken for extraction. Occasionally the bees take an unduly long time to close the cells and such combs also can be taken for extraction just to stimulate the bees. The honey combs have first to be taken out from the super and the adhering bees driven away. In cases where the owner possesses only one or two hives, the combs can be removed one after another and the bees that may be covering them may either be shaken off or blown out. When there are a number of hives to be handled, the super itself can be removed and held with its upper edge just touching the floor board; while a smoking torch is held below. The bulk of the bees will rush out and enter the hive. In large apiaries the process can be simplified by the use of the "bee escape"-a cheap and simple contrivance. It consists of a screen board, with a metal trap-like device at its centre which allows only the egress of bees. This board is kgpt between the super and brood chamber with its opening facing up, on the evening prior to the date of extraction. The next morning the bees in the super go out for their foraging, but are not able to get back and the super is thus cleared of the bees. The next process is the uncapping of the sealed combs. This is done by placing a sharp table knife flat on the sealed area and slowly shaving off the thin layer of wax The edge is likely to get blunt while cutting wax and the knife has therefore to be dipped frequently in hot water. When handling a large number of combs, it is better to have two knives, so that one can be used while the other is kept in hot water. Bees have a tendency to unduly lengthen the honey cell with the result that the combs bulge out. These may be sized just up to the width of the top bar of the super frame while uncapping. The honey should be extracted with the help of the honey extractor. The machine is to be rotated slowly at first and the speed gradually increased; otherwise the combs are likely to break by their own weight. Combs which are not properly attached to the frames can be held in position by loops of broad plantain fibre. The extractors which are in use at present remove honey from one side only at a time and the

position of the combs has to be reversed for extracting from the other side. The extracted honey should be filtered into a clean and tinned or enamelled vessel and then ripened artificially. The process consists of keeping the vessel with the honey in hot water for about half an hour, maintaining its temperature steadily at about 65° C and that of the honey at 60° C. The process not only pasteurises the honey and removes the superfluous moisture in it, but also clears it of certain impurities which are present in some samples. These collect as a scum at the top and can be easily skimmed off. The honey should then be allowed to cool slowly and bottled in air tight glass receptacles while it is still warm. Metal containers should as far as possible be avoided. Scrupulous cleanliness should be observed during all these operations and honey should on no account be touched with the hand. *M. C. Cherian and S. Ramachandran*

ABSTRACT

Conserving soil and water with stubble mulch H. H. Bennett, (*Agric. Engin., 23 (1942), No. 2.* "Stubble mulch" is defined as a process of protecting cultivated or bare land in such a way as to conserve soil and soil moisture and reduce evaporation through the use of a complete or partial surface covering composed of some form of crop stubble or residue. The primary process consists in merely stirring the soil with ploughs without mold boards to turn all the vegetation or vegetative litter under. It leaves much of the vegetable material—crop residue or vegetative litter—on the land as a surface protection against erosion. Comparing this treatment with that of basin listing, the author cites the observation at Lincoln, Nebr., that applying 2 tons of wheat straw per acre and ploughing with a blade or winged implement a few inches beneath the surface without turning the straw under, conserved 54 per cent of the rainfall. Under comparable or duplicate conditions, only 20·7 per cent of the rainfall was conserved with ordinary summer fallow and only 27·7 per cent with basin listing, even though the basin listing permitted virtually no run-off since the losses due to evaporation from the convoluted bare surface tended to offset the gains due to prevention of run-off. (*Excep. Sta. Rec. Vol. 87, No. 1, July 1942.*)

On the antibacterial action of honey. Franco, M. and Sartori, L. (*Ann. Hygiene 50 (5): 216–227 (1940*) All honeys studied were antibacterial to various species. Some were bactericidal especially to *Eberthella typhosa*, *Escherichia coli*, and dysentery organisms; others were only bacteriostatic. Acidity and increasing sugar conc. enhance the effect. The same honey might be bactericidal up to 20% concentration, and bacteriostatic at 10—5%. A specific antibacterial substance is present in the honey which can be demonstrated to be photosensitive, short exposure to sunlight greatly reduces activity, heating destroys it (60 min. at 56°C, 30–20 min. at 70°–80°C, 10 min. at 90°C, 5 min. at 100°C). Aging has little effect. Attempts to trace the origin of the substance to organs of the bee (head, thorax, honey sac) were inconclusive. The evidence points to its origin in the flowers from which the bees collect nectar. Honey from different provinces, and collected during different seasons, varied in antibacterial action. The change associated with seasons when different flowers are in bloom is considered to be indirect evidence for origin in the flower. *(Biol. Abs. Vol. 16 No. 3).*

GLEANINGS

Soil-less Cultivation. A review of the recent progress in soil less cultivation has recently been given by Prof. R. H. Stoughton (*J. Min. Agric., 49, 25; 1942*). In spite of many misconceptions and difficulties, steady progress has been made both in the laboratory and on small scale semi-commercial installations, and a stage appears to have been reached when some reliable judgment can be formed on the question. Two types of systems are in use: (1) in which the plants are grown in a tank of nutrient solution with the roots immersed in a liquid medium; (2) where the permanent substratum is an inert material such as sand

or gravel, to which nutrient solution is supplied at intervals. Carefully controlled trials have shown that in general the first of these is unsuitable for use in Great Britain, owing to the difficulty of securing adequate aeration for the roots, and the low light intesity. Far more promising results have been obtained with the second method, which may be considered under two main headings, namely, sand and sub-irrigation culture. In sand culture the plants are fed by watering with the nutrient solution from above the surplus liquid draining away. Tomatoes, chrysanthemums lettuce and a wide range of vegetables gave very satisfactory crops under these conditions, and promising results have been obtained with carnations using a slightly modified and simplified technique.

The disadvantages of the system, however, are the care needed in the control of the moisture content of the medium, and wastage of materials through drainage, but these are to some extent offset by the small cost of the outlay compared with the sub-irrigation method. In the latter case, the nutrient solution is pumped at intervals from below into the growing tank until the gravel is flooded to the top, the pump is then shut off and the liquid flows back by gravity to the supply tank. The watering and feeding can thus be made almost automatic, the aeration of the medium is excellent and considerable economy in fertilizer materials is effected. Further, chemical sterilization of the gravel is easily carried out. To meet the criticism that soil-less cultivation results in crops of lower nutritional value, chemical analysis of the carbohydrate, protein, inorganic constitutents and vitamin C content were carried out. No significant differences could be established between plants grown in gravel and those grown in soil. Experiments are now in progress at the University of Reading, under a grant from the British Electrical and Allied Industries Research Association, to test, among other things, the effect of heating the solution in the sub-irrigation culture of tomatoes. Work is also proceeding on the chemical testing of the solution by simple colour tests, so that its composition may be readily controlled according to the requirements of the crops. (*Nature, Vol. 150, No. 3797, Aug. 8, 1942.*)

Preservation of Eggs. For preservation of eggs the following points should be borne in mind; (i) That eggs when unfertilized keep better and cook better as boiled or scalded eggs than when fertile. so that when the hatching season is over, it is a good plan to pen the cocks; in a week the eggs should be infertile. (ii) The eggs should be absolutely fresh; they may be placed in the preservative as soon as they are laid. This means that the older eggs at the bottom of the vessel would be the last used. To get over this, when the eggs are about to be used there should be another vessel with preservative at hand, and the top eggs put at the bottom of this receptacle, so that the older eggs will be used first. (iii) A kerosene tin should not be used; an earthenware jar is better. (iv) When using preserved eggs for breakfast, always prick the top with a pin before placing in the water to cook. For frying or poaching this is not necessary. (v) Eggs should be used soon after they have been taken out of the solution for preservative. 1. Take 1½ lb. of lime, mix with one gallon of water; stir this well at short intervals until the lime is dissolved as far as possible. Add one lb. of salt; stir, and leave until the liquid becomes clear, then pour the liquid off carefully, leaving any sediment at the bottom; or better still, pour through a sieve. After a month add a little more lime water not lime itself. 2. Another method is to obtain a wooden box of convenient size; place a layer of salt at the bottom about 1½ inches in depth, and put the new laid eggs upright in this, small end downwards. When the bottom layer is full, cover with about two inches of salt. Repeat this process for every fresh layer of eggs. Keep the box in a fairly dry place. Eggs preserved in this way should keep for six months. For our climate method number one is better, (*J. Jam. Agric. Soc. 46*, 107—108).

Press Note

Wheat Rust Control

Investigation on the rust diseases of wheat in India has shown that the main source of infection for the occurrence of these diseases in the main crop in the plains as well as in the hills lies in the hills where the germs of the diseases are able to survive throughout the year. Thus they are enabled to pass on from the first season or April sown wheat or barley crop to the main crop sown from October. The first season crop, its stubbles and tillers as well as the self-sown plants form a continuous line for the infection of the main second season crop of wheat or barley.

In the plains however, the germs of the rust diseases are unable to survive the severe heat of the summer and consequently perish. Though the continuity of the source of infection is thus broken, the main crop in the plains gets infected by wind borne germs from the hills.

In connection with the control of wheat rusts, the Government of Madras propose to bring into operation from April 1943 the Madras Agricultural Pests and Diseases Act of 1919 in order to prohibit the cultivation of wheat or barley crops in the Nilgiri and Palnis hills between April and September and to aid the clean up campaign.

Cultivators are advised to grow *ragi*, *samai*, *korali*, rye or garlic during the period when wheat and barley cultivation is prohibited.

In order to save the wheat crop in India from the ravages of the rust diseases, the cultivators in the Nilgiri district and the Kodaikanal taluk of the Madura district should carry out the following measures:

(1) Do not have a standing crop of wheat or barley between April 1st and September 30th in the Nilgiri district and April 15th and September 30th in the the Kodaikanal taluk of the Madura district.

(2) After harvesting the main crop about February or March 'clean up' the fields by removing all stubbles, ratoon tillers and burn them *in situ*.

(3) Pull out all self-sown or out of season wheat or barley plants in the fields, in threshing floors or residential buildings whenever found between April 1st and September 30th.

If any cultivator fails to carry out the proposed measures in his fields, he will be liable to a fine not exceeding Rs. 50 or in case of default to simple imprisonment for a period not exceeding ten days and the measures will be carried out by the inspecting officer or under his supervision and the expenses recovered from the party.

Crop and Trade-Reports

Satistics—Crop—Groundnut—1942—Fourth or final report The average area under groundnut in the Madras Province during the five years ending 1940–41 represents 44·9 per cent of the total area under groundnut in India. The area sown with groundnut in the Province in 1942 is estimated at 3,260,600 acres. The estimated area for this year is less than the average area of 3,422,210 acres by 4·7 per cent. The increase in area is general outside Vizagapatam, Kistna, Tinnevelly and Malabar and is due chiefly to the prevalance of high prices for groundnut during the main sowing season. The increase in area is marked in Kurnool, Bellary, South Arcot and North Arcot. The harvesting of the summer and early crop of groundnut concluded by the end of October. The harvesting of the winter or main crop is proceeding. The yield per acre is

expected to be normal in East Godavari and Tinnevelly and below the normal in other districts due mainly to drought. The crop was also affected to some extent by insect pests in parts of Chingleput and Tanjore. The yield is expected to be 1,207,600 tons of unshelled nuts as against 1,225,310 tons in the previous year, a decrease of 1·4 per cent. The yield in an average year is estimated at 1,710,550 tons.

The wholesale price of groundnut (shelled) per imperial maund of 82$\frac{2}{7}$ lb. as reported from important market centres on the 18th January 1943 was Rs. 10—1—0 in Adoni, Rs. 10 in Coimbatore and Tadpatri, Rs. 9-10—0 in Nandyal and Hindupur, Rs. 9-7—0 in Erode, Rs. 9—5—0 in Guntur and Salem, Rs. 9—4—0 in Vizianagaram, Rs, 9—0—0 in Vizagapatam and Vellore, Rs. 8—15—0 in Bellary, Rs. 8—13—0 in Cuddapah, Rs. 8—11—0 in Cuddalore and Rs. 7—7—0 in Guntakal.

(Additional Joint Secretary, Board of Revenue).

Cotton Raw, in the Madras Presidency. The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February 1942 to 31st January 1943 amounted to 730,433 bales of 400 lb. lint as against an estimate of 559,700 bales of the total crop of 1941—'42. The receipts in the corresponding period of the previous year were 645,424 bales. 725,247 bales mainly of pressed cotton were received at spinning mills and 3,169 bales were exported by sea while 96,939 bales were imported by sea mainly from Karachi and Bombay.

(Director of Agriculture).

Thirtyfirst College Day Sports—1943

The annual athletic sports for the year 1942-43 was held on Saturday 30th January 1943 on the College grounds with great success. A large number of visitors were present. Four new records were created as noted below. Mrs. C. R. Srinivasa Ayyangar kindly gave away the prizes. The Managing committee of the Union thanks Mrs. Srinivasa Ayyangar, Sri A. Mariakulandi, President, Sports sub committee and all members who kindly helped in the conduct of the sports.

List of Prize Winners

1. Cross Country Race (5 miles) The Norris Cup—1. G. H. Sankara Reddy 2. K. P. Padmanabhan 3. K. Narasimhalu
2. 100 Metres Hurdles (The Ramaswami Sivan Cup)—1. I. L. Narasimha Rao 2. S. Krishnaswami
3. Shot put (16 lb.)—1. V. D. Kamath 2. I. L. Narasimha Rao (New Record.)
4. 100 Metres Dash (The Saidapet Old Boys' Cup)—1. I. L. Narasimha Rao 2. K. Sundaram
5. Long Jump--1. C. V. Govindaswami 2. S. Krishnaswami
6. Cricket Ball throw—1. Balasubramanian 2. Ebrahim Ali
7. 200 Metres Hurdles—1. I. L. Narasimha Rao. 2. S. Krishnaswami. (New Record 31$\frac{4}{5}$ secs.)
8. High Jump (The Tadulingam Cup)—1. S. Krishnaswami. 2. John Chin iah.
9. Hop Step and Jump—1 C. V. Govindaswami. 2. Suryanarayanan Sast y.
10. 400 Metres Race—1. C. V. Govindaswami. 2. Samuel Sundaraj. New Record 60$\frac{1}{5}$ secs.)
11. Javelin throw—1. V. D. Kamath. 2. S. Ebrahim Ali.
12. 1,500 Metres Race—1. G. H. Shankar Reddy. 2. Annaji Rao. New Record 5 min. 6$\frac{1}{5}$ secs.
13. Old Boys' Race (Handicap)—1. A. M. Kulandai 2. M. D. Azraih
14. 4×400 Metres Relay Race (Intertutorial)—C. M. John's Wards
15. Tug of War (Intertutorial)—C. M. John's Wards

Champion of the year 1943--I. L. Narasimha Rao

Estate News and Notes

Students' Tour In February the second year class camped on the Nilgiris and Mettupalayam for a week. The Class III and the students of the short courses were taken to Tirupur on a visit to the Cattle Show.

Games Inter-tutorial matches—Sri M. C. Cherian's wards won in hockey and Sri C. M. John's wards in football and cricket. *Colours*—The following have been recommended for the award of colours in the respective games. *Hockey*—C. B. Chengappa, C. Vasudeva Reddy, C. H. Sankara Reddy and N. Raghavan. *Football*—R. Bettai Gowder, G. H. Sankar Reddy and S Krishnaswami. *Sports*—I. L. Narasimha Rao.

Students' Club Sri M. S. Sundareswara Ayyar delivered an interesting and thought provoking address on 'Education of the Infant' on the 1st. February under the presidentship of Sri S. V Viswanatha, Retired Archealogist. On the resignation of Sri H. Shiva Rao of the Vice-Presidentship of the Students' Club, Mr. M. C. Cherian has been elected Vice President.

Literary Competitions An essay competition was held on the 3rd February, the subject being 'The need for the expansion of the University training corps" The winners in order of merit were T. M. Venkataraman, K. V. S. Suryanarayanamurthi, and P. T. Bhaskara Panikker. In the extempore speaking competition held on 10th February on the subject, "The influence of Newspapers in moulding public opinion" the winners were as follows in order of merit—I. C. Srinivasan, K. V. S. Suryanarayanamurthi and T. M. Venkataraman. In the intertutorial debating contest held on the 12th February Sri B. M. Lakshmipathi's wards were the winners. The subject for debate was that "The solution for the present day food problem in India lies in the immediate introduction of a system of food rationing."

The Officers' Club The Annual General Body Meeting of the Agricultural College Officers' Club was held on Friday the 12th February 1943. The following office-bearers were elected for the year 1943.

President: Sri V. T. Subbiah Mudaliar. Vice President: Sri C. M. John. Secretary: Sri S. V. Parthasarathy.

Estate Scouts On the evening of the 3rd February a fire broke out in a *cholam* stack in field No. 71 of the Central Farm and the Scouts rendered timely and notable service in extinguishing the fire. In the recent *Radhakalyanam* celebrations on the Estate the scouts did useful work. All the scouts and cubs took part in a district rally held at the St. Michael's High School grounds on the 13th February.

Departmental Notifications

Gazetted Service—Appointments

Sri P. V. Ramaiah to act as Director of Agriculture, vice Sri P. H. Rama Reddi granted l. a. p. for six weeks.

Sri C. R. Srinivasa Ayyangar, Paddy Specialist, Coimbatore, to act temporarily as Principal, Agricultural College. Sri H. Shiva Rao, Assistant Agricultural Chemist, to act temporarily as Government Agricultural Chemist. Sri K. W. Chakrapani Marar, Assistant Marketing officer, is appointed to act temporarily as Provincial Marketing Officer. Sri T. Venkatramana Reddi, Asst. in Botany, appointed as Botanical Asst. in Rubber Research Scheme.

Leave

Sri P. V. Ramiah, Principal and Govt. Agricultural Chemist, Coimbatore, l. a. p. for 1 month from date of relief. Sri C. Ramaswami Nayudu, Provincial Marketing Officer, Coimbatore, l. a. p. for 4 months from date of relief.

Subordinate Service – Promotions

Sri M. S. Kylasam Ayyar, Asst. in Entomology to IV grade with effect from 27th January 1943. Sri G. K. Chidambara Ayyar, Asst. in Chemistry to IV grade with effect from 7th February 1943. Janab Syed Ibrahim, Fruit Asst., A. R. S. Anakapalle appointed as Asst. in Paddy in the I grade (new). Janab P. P. Syed Muhamed, A. D., Tiruchengode appointed to the I grade (new).

Transfers.

Name of officer.	From	To
Sri R. Guruswami Naidu,	A. D. Kaikalur,	A. D. Proddattur.
,, S. Sangameswara Sarma,	F. M. Anakapalle,	A. D. Srungavarapukota.
,, P. Satyanarayana,	A. D. Markapur,	A. D. Vinukonda.
,, G. Narasimhamurthi,	F. M. Siruguppa,	A. D. Markapur.
,, T. V. Krishnaswami Rao,	A. D. Vizagapatam,	A. D. Srungavarapukota.
,, P. K. Natesa Ayyar,	A. D. Rasipuram,	F. M. Central Farm.
,, S. V. Parthasarathy,	Asst. in Cotton, Coimbatore,	Asst. in Botany, Coimbatore.
,, B. N. Padmanabhan,	A. D (on leave),	Asst. in Paddy, Coimbatore.
,, N. G. Narayana,	Cotton Asst., Nandyal,	Cotton Asst., Koilpatti.
,, U. Narasinga Rao,	F. R. S. Kodur,	Asst. Pomological Station, Coonoor.
,, S. Muthuswami,	Under training. F. R. S., Kodur,	Asst. F. R. S., Kodur.
,, D. V. Reddi,	A. D. Proddatur,	Senior Farm Manager, Central Farm.

Leave

Name of officers.	Period of leave.
Sri V. Satagopan, F. M. Central Farm,	L. a. p. for 3 months from 15–2–43.
,, B. L. Narasimhamurthi, Millet Asst., Anakapalle,	Earned leave for 30 days from 7–2–43.
,, K. Krishnamurthi, A. D. Paravatipur,	Extension of earned leave for 1 month from 31–1–43.
,, M. Somayya, F. M. Samalkot,	L. a. p. for 1 month from 23–1–43.
,, K. P. Anantanarayanan, Asst. in Entomology,	Extension of l. a. p. on m. c. for 1 month. from 4–2–43.
,, G. K. Chidambaram, Asst. in Chemistry,	L. a. p. for 1 month from 1–2–43.
,, K. Saptharishi, Asst. A. R. S., Aduthurai,	L. a. p. for 1 month from 5–2–43.
,, M. Ratnavelu Gownder, A. D. Bhavani,	L. a. p. for 1 month from 12–2–43.

ANNOUNCEMENT

The Ramasastrula-Munagala Prize, 1943.

1. The prize will be awarded in July 1943.

2. The prize will be in the form of a Medal and will be awarded to the member of the Union who submits the best account of original economic enquiry, carried out by him on any agricultural subject.

3. The subject matter shall not exceed in length twelve foolscap pages, type-written on one side.

4. Intending competitors should notify the Secretary of the Madras Agricultural Students' Union not later than the 1st June 1943 with a covering letter showing full name and address of the sender. The author's name should not be shown on the paper, but should be entered under a *nom-de-plume.*

5. Four type-written copies of the essay should be sent.

6. The name of the successful competitor will be announced and the prize awarded at the time of the Conference, if held this year.

7. Papers submitted will become the property of the Union and the Union reserves to itself the right of publishing all or any of the papers.

8. All reference in the paper to published books, reports or papers by other workers must be acknowledged.

9. Any further particulars may be obtained from the Secretary, Madras Agricultural Students' Union, Lawley Road, P. O., Coimbatore.

S. V. DURAISWAMI AYYAR,
Secretary.

The Madras Agricultural Journal

(ORGAN OF THE M. A. S. UNION)

Vol. XXXI MARCH 1943 No. 3.

EDITORIAL

Tree Planting With the onset of summer and the attendant shedding of leaves and drying up of all vegetation that surround us, we are left to ponder why there should not be more of the evergreen trees along the road sides and round about our habitation to afford some relief from the scorching heat. The feeling is all the more acute when we go out into the country side and find the weary pedestrian or the village cattle hastening their steps in search of a shady tree that has escaped the hand of destruction, to rest a while from the blazing midday sun. We have heard it often said, and probably observed it ourselves too, that most of the public pathways which were once decked with rows of trees planted and raised with great care by some philanthropic soul of 'good old days' have been severely denuded to make room for the electric wires that run across our towns and cities or for preventing the wear on the road surface due to the dripping of rain water from the over-hanging branches. The recent increased demand for timber for various purposes has also augmented the rapid disappearance of trees and even of saplings from the countryside. Cyclones and storms have also uprooted many trees and hastened the pace of destruction in some of the coastal districts. While we appreciate the good intentions of the concerned service departments to make their work more efficient and also realize our utter helplessness to overcome the destructive forces of Nature, we are sorry to observe that there is yet no organised effort in this country to repair this lamentable loss and compensate the destruction that has been going on all these years. We are not, however, forgetful of the salutory efforts of certain Local Bodies and district institutions in organising a tree planting day every year, but we fear that this has not been copied extensively and has not materially altered the situation. We very much wish that this drive for tree planting is more properly planned and carried out with sustained interest, so that the trees once planted are properly cared for and survive any future policy of road or village development that may be initiated.

Arboriculture to be successful requires a fair knowledge of the growth habits and requirements of the trees selected for planting, as well as their reaction to new environments. The embarrassing richness of our forests makes it no easy task to select the trees that would best suit the varied

climatic and soil conditions, that would grow quick, stand the fierce storms and live long. What is good for one tract may not suit another. In chosing trees for avenue planting, it may be worthwhile to have trees of some economic importance such as the tamarind, neem, *pungam* or *illuppai* which may yield useful products We would particularly recommend the planting of oil-yielding trees as the seeds can be gathered by the villager, crushed in the local *chekku* and the oil and cake put to a variety of uses. Again, as the trees growing round about a village are also innately connected with the economy of village life in so far as they provide timber for house construction and agricultural implements, fodder for cattle, green manure for crops, protection of the soil from wind erosion, or fuel, it is desirable to plant trees suitable for these purposes in the villages. The hon'ble Sir Jogendra Singh, Member for Education, Health and Lands, Government of India, presiding over the Forestry Board Meeting held at Dehra Dun in October last pointed out that "the time has come when the Forest Officers should include the villages as one of their responsibilities and that the need of 700,000 villages in the matter of tree plantations had received but scant attention" The hon'ble member also suggested that it may be useful to take a group of villages at a time and start plantations to provide fuel, timber, fodder for cattle and work for afforestation of areas which now lie waste. These are sentiments which deserve consideration of the Forest and other departments as well as of Local Bodies, so that we may have for each district a more precise policy of tree planting and after care with an adequate and regular supply of suitable planting material. It is common knowledge how trees planted without proper initial care exhibit poor growth and how trees planted and left uncared for are eaten away by cattle or cut down by the unthinking folk and disappear in no time. In this matter, we are reminded of the Agricultural Policeman of Haiti, West Indies, whose duty it is to prosecute any one, tenant or landlord, who without the written authority from a qualified Government agent injures, prunes, cuts or burns away trees While it may not be feasible to take action on such drastic scale in our country, we desire that the matter receives greater consideration of the authorities concerned. Probably the subject can be given prominence at the District Periodical Conferences and a co-ordinated and long range policy adumbrated as an item of Rural Reconstruction and adequate funds allotted for the planting and maintenance of trees.

Note on Improvement of the Coconut by Cross-breeding*

By C. M. JOHN,

Oil Seeds Specialist, Department of Agriculture, Madras

and

G. VENKATANARAYANA,

Superintendent, Agricultural Research Station, Kasaragod

Introduction The coconut (*Cocos nucifera* Linn.) has been an important oil yielding crop of the Tropics from ancient times and it still figures prominent in the edible oil industry of the world despite competition from other sources of edible oil supply. Though some attention is being bestowed on the selection of seed material, nothing appreciable seems to have been done elsewhere to produce economic types by cross-breeding different varieties. This is probably due to the fact that it takes normally 8 to 10 years for a coconut tree to come to the flowering stage and many more years should elapse before its bearing capacity can be fully assessed. The added risk of finding the cross progenies unproductive or uneconomic after they have been maintained at considerable expenditure for several years might have also deterred the enthusiasm of the few workers on this crop who might have conceived the idea of cross-breeding in coconuts.

Breeding in Madras Breeding work on the coconut was started in Madras at the Coconut Research Station, Kasaragod, 12 years ago with the chief object of producing high yielding and early bearing types giving large quantity of high grade *copra* (dried kernels). Under different schemes of cross-breeding, attempts were made to combine the economic characters of the different eco-types of the ordinary Tall variety, such as high production of female flowers, high percentage of setting, thick kernels, large size of nuts etc., as also the earliness of the Dwarf variety with some of the desirable characters of the Tall variety. The hybrid trees in the scheme of hybridization of the Tall and the Dwarf varieties have come to the bearing stage and in this note an account of the hybrids and the parents is given.

Tall × Dwarf crosses The scheme of crossing between the ordinary Tall variety that is largely cultivated in India and the Dwarf variety which is only occasionally met with was first conceived and started by Dr. J. S. Patel in 1931. The work has been further extended and the study continued by planting the parents and the hybrid seedlings in an area of four acres at the Coconut Research Station, Nileshwar (Kasaragod taluk) in 1934 and subsequent years. Most of the hybrid trees and the selfed progenies of the Dwarf parent which is an early flowering variety have begun to yield since 1939. The hybrids are found to be economic types being very vigorous, early bearing and high yielding in character.

* Contribution No. 22 of the Oil Seeds Section of the Madras Department of Agriculture.

Characters of the parents *Ordinary Tall variety* It is a tall growing, hardy palm attaining a height of about 40 feet or more and living up to the age of about 80 or 90 years. It begins to yield under ordinary conditions in about 8 to 10 years after planting. Under rainfed conditions the yield goes up to 100 nuts per tree, per year, which give about 30 lb. of *copra*. The kernel is thick and *copra* is of good quality and contains about 72 per cent of oil by chemical extraction.

Dwarf variety It is a delicate palm of small stature attaining a height of about 15 feet and living up to an age of about 35 years. It is a very early bearing variety beginning to flower in about four years after planting. The yield is about 60 nuts per tree, per year giving 5 to 10 lb. of *copra*. The nuts are very small in size with thin kernel. The *copra* is of inferior quality being leathery. The percentage of oil in *copra* is about 70.

Characters of the Tall × Dwarf progenies *Vegetative growth* The progenies of the cross being derived from two distinct varieties, exhibit considerable hybrid vigour even from the first year of planting. They have greater rate of leaf production and number of leaves and rate of growth of the stem than either of the progenies of the Tall or the Dwarf parents planted along with them.

For instance, the hybrid tree (Fig. 3) had a trunk length of 1 ft. 1 in. with 27 leaves in the crown in 1941 while the pure Tall progeny (Fig. 1) of the female parent of the same age did not form any trunk and had only 11 leaves. The pure dwarf progeny (Fig. 2) of the male parent of the same age had 9 inches of trunk and 22 leaves in the crown.

Flowering The hybrid flowered early like the Dwarf at about 50 months after planting while the Tall did not flower even after 63 months and is not likely to flower for another two or three years.

Usually in the coconut, during the early years of flowering the number of female flowers produced and the setting percentage are very low, and increase with age. But in the hybrid, the total number of female flowers produced in a year was as high as 433 which is much higher than those produced either by the Tall or the Dwarf parents even in their prime of life.

Fruiting The hybrid progenies gave a definitely higher initial setting percentage and produced more nuts. These were like the nuts of the Tall variety in size, thickness of kernel, quality and out-turn of *copra*. The yield of nuts was more than double that of the Dwarf progeny of the same age. In one particular cross the hybrid yielded as many as 90 nuts in one year, about three years after first flowering. This should be considered very satisfactory even when compared with the production of the high yielding Tall variety.

The following table gives the characters of the hybrid, and the selfed progenies of the parents.

Improvement of the Coconut by Cross-breeding.

The Tall Variety The Hybrid The Dwarf Variety

Characters of selfed progenies of parents and hybrid
(63 months old).

Characters	Selfed progeny of ♀ parent Tall Fig. 1	Selfed progeny of ♂ parents Dwarf Fig. 3	Hybrid Fig. 2
Height of trunk above ground level	No trunk formed	0′—9″	1′—1″
Girth of trunk at base		2′—1″	2′—11″
No. of leaves in the crown	11	22	27
Mean length of leaf	12′—8″	10′—10″	13′—0″
No. of leaves produced in a year in 1941	9	14	14
Age at first flowering	Not flowered	49 months	50 months
No. of female flowers produced in a year	...	375	433
Setting per cent	...	5·6	11·7
Yield of nuts per year	...	20	51
Copra content per nut	...	20·69 gms.	165·0 gms.
Quality of *copra*	...	poor	good
Percentage of oil	...	70	70

(*Note*—The readings for items 7 to 12 for the Tall parent tree used for the crossing and which is about 50 years old are—No. of female flowers produced in a year—236; setting percent—34·7; Yield of nuts per year—81·8; copra content per nut—206·6 gms; quality of copra—good; percentage of oil—71.)

The above table gives a comparative idea of the characters of the three classes of progenies at the same age viz., 63 months after planting under rainfed conditions.

Conclusion The trials and the work done during the last 10 years with Tall × Dwarf hybrids have definitely shown that there is hybrid vigour in the progeny and that they combine the very desirable early flowering nature of the Dwarf parent with the economic nut characters of the Tall parent. One of the urgent requirements of the coconut grower is to get early bearing economic types in place of the late bearing Tall type which he is at present cultivating. It may be now said with some confidence that the Tall × Dwarf crosses have met this long-felt want and have opened a new field in the improvement of the coconut. Cross-breeding work is on hand to produce these hybrid seedlings for distribution among coconut planters.

A Note on the Cultivation of *Dioscorea esculenta* in the Neighbourhood of Anakapalli

By A. SANKARAM, B. Sc. Ag,

Introduction *Dioscorea esculenta* Burk. is an economic plant largely grown by the vegetable gardeners in the neighbourhood of Anakapalli (Vizagapatam District). It is cultivated in some places in the north of the district also. The underground tubers which the plant produces are largely used in the district as an agreeable vegetable. Well-developed tubers resemble potatoes in many respects, except for the numerous root fibres on them. In taste they are somewhat sweeter than the common potato and easily lend themselves suitable for the preparation of a variety of dishes. It is, hence, commonly nick-named as the 'Indian potato'. It is a cheap root vegetable available in the local markets and is favoured universally by the rich and the poor. Its Telugu name is *silakadam*.

Botanical *Dioscorea esculenta* Burk. belongs to the family Dioscoreaceae. Like other members of the family the plant is a herbaceous annual with twining or procumbent stems bearing large or small subterranean tubers. The following is a complete botanical description of the plant.

Stems prickly, leaves simple, orbicular or reniform, accuminate or cuspidate, base cordate, 2 to 5 in. long; petioles about as long; spikes 6 to 18 in. long; flowers erect, with a disk within the 6 perfect stamens. Capsule oblong, slightly narrowed below, apex retuse, seeds broadly winged all round. Tubers numerous, edible, stalked, protected by root fibres, generally bearing spines up to 0·5 in. long. It is very variable under cultivation when it often loses the spines in the roots.

Soil and preparatory cultivation Soils of high fertility with free drainage, *e.g.*, sandy loams, are considered to be ideal for this crop. However, soils of medium fertility when well supplemented by organic manures give equally good results. But free drainage is of paramount importance. After the removal of the previous crop the preparatory cultivation commences. Eight to ten ploughings are considered necessary to bring the land to very fine tilth. In the bed system of planting the field is thrown into beds of 8 ft. square. Irrigation channels are formed between every set of two beds. Where planting is on the crest of ridges the plot is worked up into ridges and furrows with irrigation channels at 16 ft. length of the furrows. In the garden lands the crop comes in rotation with other vegetable crops like brinjal, *bendai*, etc., or *ragi*. It is also commonly grown mixed with other vegetable root crops like colocasia (Tel: *chama*) and *Dioscorea alata* (Tel: *pendalam*). It is a common practice to plant setts of tapioca around plots of this crop.

Manures and manuring The crop is one which shows marked response to good manuring. Sheep penning is generally resorted to besides

Dioscorea esculenta—tubers

the application of 15 cart loads of farm yard manure. Still higher doses of manure are considered to give economic yields.

Seed material and planting The preparation of the land which commences in March comes to a close by the end of April, and planting will be in progress towards the end of May or during the month of June soon after some showers of the south west monsoon are received. The seed material for planting consists of mature tubers taken from the previous crop and preserved with care. During the harvest in January good and healthy tubers are carefully selected to serve as seed material for the next year's crop. The seed material thus collected is stored in a cool place under a thatched shed.

The prepared seed beds or ridges and furrows, as the case may be, are first watered. Planting is done in rows 9 inches apart on square, one tuber at each sowing spot, and four to six inches deep in the soil. In the ridge system tubers are planted on the crest of the ridges 9 inches apart. About 1500 lb. of tubers are required to plant an acre of land.

Irrigation Maximum production calls for copious watering coupled with free drainage. On the whole the crop requires eight irrigations besides the rainfall received during the life of the crop. The practice of well irrigation with a *picotah* is very common with the growers.

After-care The tubers begin to germinate in about 10 to 12 days after planting, and in about six weeks the vines require strong support for rapid growth. At the centre of a set of four vines, each arising from one tuber, a single bamboo pole is planted and the set of four vines is trained on to it. Nearly 10,000 bamboos are required for propping a crop in one acre. Where holdings are small, extending over few cents, dried plant stems or any suitable material is used for the purpose. A fortnight after planting the plot is weeded and two weeks later the first hoeing is given. A second hoeing follows a month later. The plots are weeded as often as necessary. About three weedings and two hoeings in the duration of the crop, will ordinarily keep the field free of weeds.

Harvest The crop stands in the field for more than six months from the date of planting. The sign of maturity is that some of the older leaves turn yellow and begin to drop off. Further the cracking of the land round about the plants is an additional feature of maturity of the crop. The harvest commences in November and is carried on in stages till the end of January. The harvest consists in lifting of the entire vines by digging round the plants with a crow bar. Great care is exercised during the harvest to avoid injury to the tubers by way of cuts, as such tubers will have little market value. Each vine produces 3 to 6 tubers depending on the soil, season and manure applied. The tubers are separated from the plant and after a little drying they are shaken to remove the adhering soil. The roots of each tuber are removed with a knife and they are thus rendered fit for sale in the local markets.

Yield and marketing A successful crop yields 8,000 lb. of marketable tubers and an average yield can be taken to be 7000 lb. per acre. Still higher yields would be obtained during seasons of normal and well distributed rainfall. The tubers are available for sale from November to February. They command a fair sale in the local markets. It is at present not available in large quantities for export to distant markets. The price varies within a wide range from 8 annas to a Re. per maund of 24 lb. The price is usually at its maximum during October and at its minimum in December.

Economics of Cultivation The cost of cultivation comes to Rs. 142—6—0 per acre. Taking an average crop to yield 7000 lb. per acre and the produce valued at 6 ps. per lb. the gross income from an acre will be Rs. 218—12—0, with a net gain of Rs. 76—6—0. Under the contract system of disposal of the standing crop, common with many of the farmers, the *ryot* realises a net gain of Rs. 60 per acre, the harvest and cleaning charges being borne by the contractor.

Cost of cultivation per acre—Details.

Preparatory cultivation, 8 ploughings and ridging ...	Rs. 10	0	0
15 cart loads of cattle manure and sheep penning ...	20	0	0
Seed material (1500 lb.) and planting—10 men ...	49	6	0
8 irrigations	24	0	0
After care (2 hoeings and 3 weedings)	7	0	0
Harvesting and cleaning—30 men	7	8	0
Assessment on land, etc.	4	8	0
10,000 short bamboos for propping—proportionate cost per year ...	20	0	0
Total cost of cultivation per acre	142	6	0
Yield—7,000 lb. valued at Rs. 0—0—6 per lb. ...	218	12	0
Net gain per acre	76	6	0

Note:—Agricultural holdings of this particular crop are mostly small varying from 5 to 50 cents. Small holdings as these can easily be managed by a farmer and his family without any additional cash expenditure. Hence the total income forms a net gain to the farmer. In the case of larger holdings of one acre and more cash expenditure will be as high as Rs. 54 per acre. Many a farmer of the area cite this as an important reason for raising the crop on small holdings.

Conclusion In and around Anakapalli the crop is commonly grown by the market gardeners. The average holding of a *ryot* with reference to this particular crop ranges from 5 to 50 cents. Only a few *ryots* grow it on an acre scale. At present there has not been any appreciable demand for the tubers from outside the production zone. This is largely due to its being little known in many parts of our presidency. In view of the decent profits arising out of the cultivation of this crop it should be an attractive proposition for market gardeners in the neighbourhood of urban areas to take to its cultivation.

If at the present juncture as a part of the "Grow More Food" campaign advantage is taken to raise this cheap yet delicious root vegetable in all suitable localities, the object of this short note will be more than achieved.

Acknowledgment I am deeply indebted to Sri S N. Chandrasekhara Ayyar, M.A., Lecturer in Botany, Agricultural College, Coimbatore, for kindly furnishing a complete botanical description of the plant.

Improved Agricultural Practices Introduced in Hindupur Taluk

By K. V. SESHAGIRI RAO,

Assistant Agricultural Demonstrator, Hindupur

***Pillipesara* in *Ragi* as a means of grow more food** In the taluk of Hindupur of the Anantapur District it is a general practice to grow a crop of *ragi* from March—April to August—September or June—July to October—November in the *ayacut* under tanks aided by wells, instead of paddy because of the insufficient supply of water in the early part of south west monsoon. The crop is invariably transplanted either in beds or in rows and before the end of a month after transplantation, a hoeing or two is given to remove weeds. A few days later in case of failure of rains a light irrigation is given wherever possible. On the small ridges formed at intervals of 3 to 5 feet lablab is raised. Two to four months after the harvest of *ragi* the lands lie fallow but for lablab. A portion of the early planted field is set apart for sugarcane planting. The rest of the whole area or a part of it, is put to paddy depending upon the quantity of water available in tanks.

By way of an improvement of the existing conditions *pillipesara (phaseolus trilobus)* was inter-sown in two years at 25 lb. per acre at the time of the final hoeing instead of lablab which resulted in :—

(i) The yield of *ragi* was about 5 % higher than the one without it.

(ii) After the harvest of *ragi* 1 to 3 cuttings of *pillipesara* forage was obtained depending upon the duration of the fallow period. Fifteen to twenty animals could be fed continuously on one acre produce with the result that there could be a 50 % higher yield in milk not to speak of the improved condition of the animals and (iii) The subsequent growth when ploughed in was manure to the next crop.

Sugarcane planting. Sugarcane is a paying crop which the *ryots* grow to get money to meet their various items of expenditure. It has been the endeavour of the Agricultural Department to improve it in all aspects viz., varietal, cultural and manurial. One of the methods of planting is to have the setts end to end in the row. With the same number of setts per acre, instead of their being in the line end to end if planted slantingly at about 45 degrees to the sides of the furrow and all in one direction, good results are obtained.

Observations on the two comparative methods of planting during the past six seasons show that (i) the slant planting in the furrow effects greater percentage of buds germinating successfully. When setts are planted end to end in the furrow there is a chance of the setts being pressed down to the level of the unploughed region at the bottom of the furrow. In the case of the setts planted at an angle to the furrow the setts cannot be pressed down so deep. Consequently below the setts there will be no hard layer of earth.

(ii) In the slant planting the stools are nearer each other than in the other system, therefore lodging is less.

(iii) Because of the greater number of plants in unit area and less expense on account of absence of propping the plants, there has been greater nett return per acre.

(iv) Yields were noted to be higher in the slant planting system.

The cultivators of the tract who have been convinced of these advantages are slowly taking to this.

A Plea for the use of Wooden Grinder Rice

By R. SWAMI RAO, L. Ag., M. A. S.,
District Agricultural Officer,
AND
Dr. S. RANGASWAMY,
Municipal Health Officer, Cocanada

The food problem, which is looming large in the eyes of all, at the present moment, is not a war time necessity alone. It exists at all times, but during war time the matter assumes tremendous importance and all energies are directed towards the production of more food.

One of the methods suggested to meet the shortage of rice is to improve the quality of rice. Rice, as at present consumed, is mostly machine milled, devoid of germ and bran. This high polishing has been primarily responsible for the prevalence of certain diseases, chiefly beri-beri in the rice growing tracts, chiefly the 'Circars' of the Madras Presidency.

Husking of paddy is done in mills, or by pounding in a mortar. An improved method suggested is by the use of the wooden grinders which shells the paddy but does not remove the bran from the rice. The analysis of rices obtained by the three processes of milling is given below.—

Constituents	Wooden grinder	Hand pounded	Machine milled
1. Protein	7·24	6·79	6·70
2. Fat	2·33	1·42	0·73
3. Ash	1·34	1·14	0·83
4. Carbohydrate	75·04	76·19	77·34
5. Calcium	0 007	0 007	0·005
6. Phosphorus	0·231	0·209	0·158
7. Iron	4·55	3·57	2 88
8. Caloric value	350·10	344 70	342·70
9. Moisture	14·05	14·46	14·40
10. Vitamin	+ + + +	+	...

From the above it is clear that the wooden grinder rice is the best. Recently the Government of Madras have sanctioned a sum of Rs. 2,000 for the manufacture and distribution of wooden grinders in the East Godavari District. Wooden grinder for husking paddy should become as popular as the coffee grinder with the discriminating public.

There are limitations for the use of wooden grinder rice. It takes a longer time to boil, consumes more fuel and the housewives may find it irksome to cook. This can be obviated if it is soaked in water for 3 or 4 hours before boiling. Less quantity should be eaten, otherwise there will be digestive troubles in the beginning. The stuff should not be stocked long, as it is said to be more susceptible to insect attack than the milled rice. It can be stocked for a week in large families and in small families daily requirements may be obtained as in the case of coffee powder by the use of coffee grinder. The use of wooden grinder will be an auxilliary in the 'grow more food campaign' as an aid to National War Effort. If the wooden grinder rice becomes universally popular the shortage of rice in the Presidency will be reduced by nearly 8 per cent.

SELECTED ARTICLE

The Migratory Locust in South India

The migratory locust (*Locusta migratoria* L.) is another of the potential pests of India that may at times assume a serious character. Specimens of the solitary phase are met with in small numbers in almost all parts of India, but so far, no observations appear to have been made anywhere on its breeding habits or on its powers of migration, nor are there any published records of instances of local multiplication.

Observations made in the course of locust surveys carried out in the desert areas of Baluchistan, Sind and Rajputana during 1931—1938 have thrown very interesting light on the migration and breeding of the *solitary* phase of this species (Rao and Bhatia, 1939). In the year 1937 especially, valuable data were obtained which showed how this locust bred in large numbers in spring in the hill-valleys of Baluchistan, and migrated in summer over a distance of over 300 miles to the desert areas of Bikaner and Jaipur, and bred there in July—August. The new generation of adults produced here migrated with the cyclonic winds accompanying a depression from the Bay of Bengal in September into the Palanpur, Sirohi and Mehsana areas of western India and gave rise to large bands of gregarious hoppers there. The hopper infestations found attacking millets in the Sirohi and Mehsana areas in October, 1937 should have been pronounced to have resulted solely from intense local multiplication, if the earlier data in regard to the breeding in Baluchistan and Bikaner had not been collected already.

Mention made by Cotes (1891) in the *Indian Museum Notes* of a great locust invasion in Madras in 1878 prompted me to seek the original records for studying the data, if possible, in correlation with rainfall and seasonal winds. With the kind help of the Government of Madras, printed records of the Proceedings of the Board of Revenue pertaining to the locust infestation of 1878 were obtained in 1938 and studied. Subsequently in 1941, further records were examined with permission at the Madras Records Office, and recently in 1942, data on the prevalence of locusts in 1878 in the Mysore State were, with the kind courtesy of

the Chief Secretary to Government, Bangalore, extracted from the *Mysore Gazette* for 1878. As a result of studying the information thus gathered, and correlating them with the available meteorological data, it has been possible to make a rough conjecture as to the conditions under which the infestation had probably originated and to outline the probable course of its history. A detailed account of the infestation is proposed to be written up in due course, after collecting some further data not available at present, but in the meanwhile, a brief account of the outbreak as far as it can be ascertained from the data on hand will be given below.

The nature of the records The records in question are in the form of printed Proceedings of the Board of Revenue, and Orders of the Government of Madras on reports received from the Collectors of various districts on the movements of locust swarms and on the damage done to crops. Some of them deal with correspondence with Dr. Bidie, then Superintendent of the Madras Central Museum and Dr. Shortt, a retired Surgeon-Major of the Medical Service, on the subject of identifications of the specimens sent to them. The records are, on the whole, fairly complete and cover almost the whole course of the infestation. Indeed, it is seen from one of the Proceedings of 1883 that most of these records had already been studied by Mr. A. J Stuart, Collector of North Arcot at the time, and attempts had been made by him at drawing certain general conclusions. He was rather inclined to suppose that the infestation had originated by an incursion of swarms, carried into India from across the ocean by the south-west winds. He also considered that the final disappearance of locusts at the end of 1878 was similarly due to their being driven into the Bay of Bengal by the agency of the south-west current. Various other deductions made by him on the life-history of the locust in the course of his report, look rather unconvincing in the light of the highly developed locust lore of modern days.

The identity of the locust In a note on the locust invasion of 1878, Cotes (1891) gives a brief summary of the course taken by the invasion in South India, and observed, in regard to the identity of the locust concerned, 'nothing seems to have been ascertained at the time of the invasion, though the insects were spoken of in one of the reports as belonging to the species *Locusta migratoria*.' A set of specimens furnished by the Madras Central Museum as representing the locust of 1878 was examined by Dr. Henri de Saussure and consigned to no less than six species of Acrididae, consisting mostly of ordinary grasshoppers—species of *Acridium*, *Tryxalis*, *Euprepocnemis*, etc., and only one specimen in a very poor state of preservation being found to be *Pachytylus migratorius* or *P cinerascens*. There is little doubt that the set furnished was from random collections made by village officers in fields damaged after the main swarms had flown away, and naturally ordinary grasshoppers must have figured largely in such collections. Since no authentic specimens are now available for inspection, and since an infestation of a similar character has not developed in South India since 1878, it is not possible to make any positive statement in regard to its identity. Fortunately, however, there are some definite clues in the body of the records to indicate its identity: (1) the gregarious hoppers found attacking crops in January, 1878 in the Tinnevelly district were described to have been of 'reddish-brown' colour, and (2) the young insects (hoppers) observed in the Krishnagiri taluk of Salem district in August, 1878 were said to have been 'black and gold'. The coloration would indicate that the hoppers were definitely the young stages of *Locusta migratoria*. Again, in the case of pairing locusts in the neighbourhood of Coimbatore in April, 1878, the males were said to have been very small and of a green colour, which is true of the *transiens* and *solitary* phases of *Locusta*, and in another case of migrating swarms found in the Salem district on 27th July, 1878, the males are stated to have been yellow and the females

brown in colour, characteristic of the *gregaria* phase. Surgeon-Major Shortt, who had received specimens of the locust from the Collectors of various districts reported that they were variously coloured, some being spotted, others brown, yellow or green, which again is indicative of the migratory locust. There seems to be, on the whole, little to doubt that the Madras locust of 1878 was *Locusta migratoria* L.

The history of the infestation—The earliest information on record is a report from the Collector of Trichinopoly (5th January, 1878) regarding a heavy infestation of crops in about 70 villages in the Perambalur taluk and the northern part of the Trichinopoly taluk (probably in December 1877). The crops affected were *Cholam* (sorghum) and *cumbu* (*Bajri*) and apparently both hoppers and adults were present. Similarly, the Collector of Madura reported the occurrence of locust damage in January-February 1878 in the Kamuti, Rajasingamangalam and Pallimadam taluks (of the present Ramnad district), and the Collector of Tinnevelly of a heavy attack of hoppers and adults in the Ottapidaram and Sattur taluks at about the same time. Cotton was reported to have remained untouched. During March, 1878 heavy breeding was reported from the planting areas of the Anamallai hills.

From the meteorological data available, it would appear that during 1877 there was a serious shortage of rainfall in July-August, following which heavy rainfall occurred in September-October in most parts of the Peninsula. In addition, the north-east monsoon would appear to have been specially active in the coastal districts of the south in November-December. It is presumed that a widespread breeding of the *solitary* phase of *Locusta* had taken place in September-October in most parts of the south of India, and that the adult locusts bred in these areas had been swept down in a southerly or south-westerly direction by the cyclonic winds of the N. E. monsoon into the southern districts of the Presidency during November and December. Favoured by the high rainfall, dense egg-laying appears to have followed, leading to the development of heavy infestation in the Trichinopoly, Ramnad and Tinnevelly districts. Adults appearing in the course of January, February and March, 1878, formed swarms, which soon began flying about the country. Winds prevailing in the south of the Peninsula during February, March and April are variable, but are mostly east to west, south-east to north-west or south to north. Consequently the main direction of the swarms was towards the north or north-west, and flights reached Madura, Coimbatore and Malabar districts from the south. In March, flights passed over the Nilgiris and reached Wynaad, Coorg and Mysore. In the Mysore State, swarms were recorded in Hassan and Kadur districts by the middle of March, and in the Chitaldrug district in the third week. Flights were recorded in the Kudligi taluk of the Bellary district on 22nd March, and a week or two later in the Hospet, Hadagalli and Harpanaballi taluks. By the end of March, swarms were reported at Kod and Kalghatgi in Dharwar district of Bombay Presidency, during April, locusts were observed round about Dharwar and Gadag, and by the last week of the month, flights had reached Saundatti in Belgaum district.

Good rainfall occurred in April and May in Coimbatore, Madura and Tinnevelly districts, in most parts of Mysore and in the Bellary district, and as a result, egg-laying by swarms took place in most of these areas in May, and in due course hoppers appeared and attacked the crops in May-June. The hoppers became fledged in June-July, and before long the young swarms were found taking wing. As by this time, the south-west monsoon was in full swing, the flights were, on the whole, directed towards the north-east, so that locusts bred in Madura and Tinnevelly were carried gradually into Trichinopoly and Tanjore; those from Malabar and Coimbatore into Salem, North Arcot, South Arcot and

Chingleput; and those bred in south Mysore, through Bangalore and Kolar districts, into Chittoor and Nellore districts, while those from Kadur, Chitaldrug and Tumkur into Anantapur and Cuddappa districts, and ultimately into Nellore.

As the central districts of Salem, North Arcot and Chittoor, and the districts of the East Coast fall within the rain-shadow of the Western Ghats, the rainfall in the S. W. monsoon period is relatively light. July was comparatively dry but fairly good rain fell in August and September in the central districts. There was little breeding during this period, except in the Krishnagiri taluk of Salem district in August, and in the vicinity of Chittoor during September. Owing to this paucity of breeding, a progressive diminution in the number and in the density of swarms was noticed by September 1878. During October-November comparatively few swarms were reported, the few on record being from South Arcot (October, and November) and Nellore (November). In these instances, the direction of swarm flights would appear to have been modified by the winds of the north-east monsoon. The rainfall of the return monsoon was defective in the southern districts in 1878, and there was apparently no swarm breeding anywhere, and it would appear as if the remaining locusts became scattered over the country as solitary individuals, thereby bringing the infestation of 1878 to an end by December.

Flights of the Bombay locust in 1878—Some of the Board's Proceedings belonging to the period October, 1878 to January, 1879, deal with reports of locust flights that took place in Bellary and Anantapur districts in October, 1878 and in Kistna district (Muktyala, Tenali, and Rapalle) in November-December, 1878. These, however, were evidently flights of the Bombay locust (as is evident from a reference to their red colour), which had presumably originated from the Dharwar-Belgaum area and had proceeded in an eastern or north-eastern direction during October-November. Heaps of these locusts were said to have been found dead in the fields during the cyclonic weather that prevailed in Kistna district during November-December, 1878.

Flights in the Ganjam district.—Three of the Proceedings of 1878 refer to reports received from the Collector of Ganjam regarding locust flights that had taken place in the Ganjam district in June and September, 1878. The flights appear to have occurred in the hill areas (2 000 to 4,000 ft. high) known locally as 'Maliahs'. The general direction of swarm movements in June was from west to east, and they would appear to have come from the low-lying valleys, situated to the west in the territories of Orissa and the Central Provinces, and passed over the Balliguda and Goomsur Maliahs north-eastwards into Boad. There are no indications that breeding had occurred, though the standing crops were said to have been damaged. There is no clue in the descriptions of damage given as to the species of locust concerned in these attacks, though it is probable that it was *Locusta* Cotes (1891), quoting from C. N. Gholh's Report of 25th February, 1890, states that 'locusts appeared in small numbers in 1878 in Orissa, but did no appreciable damage', and it is not improbable that these were part of those emerging from the Ganjam Maliahs.

Flights in 1881, 1885 and 1886.—Board's Proceedings for the years 1879 to 1886 were examined, among which references to the appearances of small locust swarms (presumed to be of *Locusta*) are found during the years 1881, 1885 and 1886. *In 1881*, the Collector of Madura reported the appearance of a swarm of small locusts in a few villages of Tirumangalam taluk in the month of April. It was stated that they injured the crops a little and perished in the rains that fell 4 or 5 days later (possibly meaning that they disappeared). *In 1885*, there were three reports, of which one referred to locusts that appeared in crowds at Mangalam village in Madura taluk early in July, 1885, and damaged the crops. In the case

of the second, it was reported that a locust swarm appeared on the morning of the 3rd August 1885 at Kothamangalam in Lalgudi division of the Trichinopoly taluk from the western direction, and after attacking sugarcane, *ragi* and *Samba* Paddy, flew towards the east after three days. In a third case the Collector of South Arcot reported the appearance of locusts in the Vriddhachalam taluk in September, when they bred in large numbers and damaged the crops severely. In 1886, the Collector of Madura reported the destruction of young gingelly crops in Periakulam taluk about the 10th June, 1886, by a certain kind of locusts (which were, on reference, declared by Mr. Edgar Thurston, Superintendent Central Museum, Madras, to be the 'true locust'—presumably *Locusta migratoria*). Except perhaps in the last case, it is not possible to say which species was concerned in these attacks, but on account of the coincidence in the time of occurrence and in the circumstances connected therewith, the species was most likely to have been *Locusta* as in 1878. It has not yet been possible to examine records later than 1886, but to the best of my knowledge there has not been any outbreak of *Locusta* in Madras since 1906, when I joined the Madras Agricultural Department.

The probable origin of the 1878 *infestation.*—It is, of course, rather difficult to say, at this distance of time, how exactly the locust outbreak had originated. Even at the time of the invasion, however, it was the opinion of more than one responsible officer that the locust trouble had some connection with the occurrence of abnormally heavy rainfall during the last four months of 1877, following a long period of scanty rain during 1876-77. It is surmised that in 1876-77, while the general drought lasted, the breeding of insects in general, and of migrating insects like locusts in particular, was restricted to and concentrated in a few places where local rain had fallen. Generally, even in years of drought, hill areas get more rain than the plains, and there is little doubt that small concentrations of *Locusta* had formed on the hill areas In more than one report of 1878, it was mentioned that breeding had occured in the grass areas along the hill-flanks, and in some it was reported that locust hoppers had invaded cultivation from the hills. Uvarov (1936) also mentions that, in the case of outbreaks of the Oriental Migratory locust—*Locusta migratoria manilensis* Mey.—in the Philippines and Borneo, they are associated with grass areas connected with shifting cultivation on the hills. Since shifting cultivation is quite in vogue on the hills of South India, it is probable that the outbreak centres of 1878 invasion had developed on the hill-flanks of the Western Ghats, the Shevaroys, the Kollimalis, the Pachamalais and other hill-ranges. Incipient swarming, begun on the hill-flanks in 1876-77, had probably become intensified on the plains during the heavy rains of August-September-October, 1877.—*Extracted from Presidential Address delivered at the 30th Indian Science Congress 1943 by Rao Bahadur Y. Ramachandra Rao.*

ABSTRACTS

Tea leaves as a maintanance food for animals, W. King Wilson, (*Nature Vol. 150, p. 199—201, August, 15. 1942*). In these days, when the conservation and utilization of vegetable waste of all kinds is so urgently necessary it is desirable that the possibilties of feeding spent tea leaves, which are produced in such large quantities should not be overlooked.

Tea drinking has greatly increased in the United Kingdom in the past century, The increase is from 1·4 lb. per head a century ago to 9·2 lb. before the War. In Great Britain about 200 000 tons of spent tea leaves are available annually which might be utilised, with other waste food stuffs for domestic animals.

Analysis of a sample of spent tea leaves showed that it contained 84·2 per cent water and 15·8 per cent dry matter; a pound of wet leaves was equivalent

to about 3 oz. of air dry meal. The dry matter contained 26·1 per cent fibre 1·2 per cent oil and 4·6 per cent mineral matter. The high protein content is deceptive since much of it is in an indigestible form owing to the high tannin content of the leaves. In an artificial digestion test the dry substance yielded only 3·7 per cent of digestible protein. The tannin may also tend to reduce the digestibility of the protein in other foods with which tea leaves may be mixed.

Feeding experiments were conducted with rabits. The results indicated that adult rabbits could be maintained in body condition on a ration in which 10—20 per cent of the concentrates were replaced by spent tea leaves. There was an increase of live weight in all groups, being greatest on the control diet and lowest on 20 per cent replacement of concentrates by the tea leaves mixture. In neither case there was adverse effect on subsequent fertility. M. A. S.

Colours in food *(Nature, May 16, 1942).* The practice of adding colouring matter to foods is now wide spread in spite of official disfavour. The principal reasons for it are to replace colour lost in processing or to imitate an article of superior quality. Delicate tinting of an article of food often made it more acceptable to the public who demanded such colouring. Artificial colouring also serves to compensate for the unavoidable deterioration of colour which often occurs with time and also to standardize the products.

Foods are coloured by the addition of metallic salts such as copper sulphate, natural colouring matters such as cochineal, saffron, or annatto, and synthetic dyes, the principal method now in use.

Synthetic colouring matters have long been known to have various kinds of biological activity. Though the pharmacology of medicinal dyes have been much investigated the situation seems less satisfactory in the case of food dyes. Cases of dermatitis directly attributable to the synthetic dyes have been recorded. It is now recognised that many fluorescent dyes, introduced into the body may lead to lesions of the skin and that malignant tumours of the liver may be produced in rats and mice by the administration of large doses of some azo dyes. Though investigation with food dyes having structural resemblance to these have failed to reveal any deleterious effect on experimental animals, it is quite likely that the effect may not be the same on human organism. The possible cumulative effect of frequent small doses also cannot be ignored.

The above factors suggest that the time has come for a more intensive and thorough study of the effect of food dyes on human system and a review of the current practices and the existing regulations relating to this matter to draw up a legal schedule of permitted colours. M. M. K. M.

Gleanings.

Collective farming in Russia and the Ukraine. Sir John Russel has made a study of Russian Agriculture, and, through his visits to that country from time to time, has been able to observe trends in agricultural policy, and the results of the State and of collective farms. He discussed his observations in a lecture recently delivered at the Royal Institution.

It was impossible to arrive at once at the most desirable system of land utilization, this being influenced by progress in farming methods particularly as regards mechanization, and the effect of this on the growth of the workers' interest in the State or collective unit, as opposed to his own personal stake in the land. The application of modern machinery to tillage, and of methods of livestock improvement and disease control to herds and flocks are more suited to large than to small units, and it is probable that success in these directions influenced the workers' views as to the extent to which they were prepared to

identify their own interests with that of the large unit in which they are employed.

After the Revolution, State farms were developed, but the peasants, who expected nothing less than individual ownership of the land that they tilled, were not then sufficiently mature, either politically or technically, to make a success of this form of organization. Instead of the State farm, the collective farm figured more and more prominently in the development of Soviet land policy. Thus, by 1939, the area occupied by collective farms was more than eleven times that of State farms.

Collectivization is based on the principle that an entire village, with its land, is run by the inhabitants as one farm, boundaries being obliterated, and the whole area divided into a few fields, the number depending on the rotation. All possessions are pooled, and the workers share the produce remaining after paying out the Government share, and meeting other obligations. Collectivization at first met with great opposition, particularly owing to the compulsory pooling of all livestock ; peasants who by years of hard work and economy, had got together a cow and a few pigs, found it difficut to have to restart from the same level as those who had never made any sacrifice to provide their families with livestock necessary to maintain them in milk, butter and other produce. For this reason, collectivization at first resulted in a heavy decrease in the numbers of livestock. The opposition to collectivization decreased when the benefits of the tractor in large-scale farming were realized, and later by the action of the State in securing the land to the collective farm for ever, and in giving to each householder a small plot of land, a cow, one or two pigs and poultry. The peasant of the collective farm is allowed to sell the produce of his plot and of his stock. A worker's time is shared between the collective farm and his own plot and in the same way, his income is derived from those two sources.

Sir John gave some data showing the proportion of workers' time spent on the collective farms, the proportion of his total income derived from that source, and the influence of efficiency in the management of the collective on the proportion of his total earnings derived from it. It has become necessary, in some instances to enforce a minimum of two hundred working days per annum on the collective farm in order to prevent the peasant from devoting too much of his time to his own plot and stock.

The most important feature of the new system however, is, that production is planned, each farm being told what, and how much, to grow for a period of five years. Requirements are allocated to the different districts, and each farm in the district is alloted its area for the various crops, and told what quantities of animal products are expected of it.

Great efforts are made to utilize science. Thus extensive soil surveys are carried out, and made use of in developing rotations; one important result of this is a reduction in the area of fallow from 35 per cent under the old three course system to 20—25 per cent now that rotations are practised. Science also plays a part in the struggle against drought; the importance of this can be understood when it is realized that in large areas in the south the average annual rainfall is not more than 12 inches.

The standard of comfort and of living of the Russian farm workers has not reached that of the British land worker. Houses are smaller, and are not so well furnished. The diet is simple, and would be considered monotonous by many standards. Great strides have been made in education, and by 1939 the ladder was complete, every child having an opportunity of university education.
Nature, Vol. 149, No. 3790, June 20, 1942.)

Extent of root system of plants Recent knowledge about roots has given new perception about their extent. T. K. Pavlychenko has measur d the roots of single prairie grasses grown free from competition of other plants and has recorded more than 300 miles of root belonging to a single plant three years old, while a single plant 80 days old had 54 miles of roots of first and second order alone. A young plant may have a net gain of the order of one mile of root daily. Roots are neither permanent, as a rule, nor static. The finer roots of a living plant are constantly being shed, and thus are taking part in the cycle of decomposition in the soil.

There is a balance between the amount of root and the amount of top. By cutting the tops of a plant—say, by mowing the lawn—the roots are also trimmed. A closely cut lawn suffers during a drought because the diminished roots are not able to reach the soil moisture in the deeper layers Dr. Hugh Nicol (*Nature, July 4, 1942.*)

Nutritive value of dried and dehydrated fruits and vegetables Research in the past 25 years has indicated the necessity of inactivating the enzymes of vegetables by scalding or by some other means prior to dehydration in order to obtain dehydrated vegetables of good palatability, high vitamin content, and good keeping quality. For retention of vitamin C it has been found necessary to store the dried vegetables in the absence of air. Dehydrated fruits retain vitamins, particularly carotene and vitamin C, much better than those which are sun-dried. Sulphuring of fruits aids in the retention of vitamin C, but causes the almost complete destruction of vitamin B_1 content.

(*Exp. Sta. Rec. September 1942.*)

Cattle averse to grass In a paper published in the *Indian Farming* for June 1942, K. Cherian Jacob has described the characteristics of a peculiar breed of cattle found in some villages near hilly areas of the North Arcot and Salem districts of the Madras Province. These cattle do not eat grass but only browse on the tender shoots of a tree growing wild in the area, known as *thuringi* (*Albizzia amara* Boivin—Leguminosae), and so this breed is known as *thurinji thazhai madu.* The cows also feed only *thurinji* leaves and no other food or fodder is given to them. A cow yields 4 to 6 lb. of milk per day. The milk of this breed is considered to be more nutritious than that of other types. The calves also do not eat grass and have to be fed on tender *thurinji* leaves. This breed is maintained more for the dung, which is considered to have superior manurial value due to the exclusive leguminous feed of the animals. They are penned in the cultivated fields during the fallow period. These cattle are in a semi-wild state and are not used for drought purposes or other agricultural operations. However, in some villages they have been domesticated and are used for farm work. They are reported to be very prolific breeders. M. A. S.

Production of cotton cloth without spinning or weaving A new process has been developed in New Brunswick for the production of cotton cloth without spinning or weaving. This is done by pressing carded cotton into a fabric with the help of a plastic material as binder. The cotton fibres are then reinforced by putting on cross lines of adhesive plastic in a printing machine. This new fabric is called 'Masslinn'. It is now being made for the military. The new fabric, as it is, is not suitable for clothing; it can however, replace only some of the cheap wooven goods; it can also replace paper for many purposes. For instance, it is likely to be used for table cloth, window draperies, sheets, book bindings, etc. It has a greater flexibility than paper; it does not disintegrate when wet. The fabric can also be washed. The cost of its production is rather low being approximately equal to that of paper. P. B S. (*Science and Culture, January 1943*).

Some significant findings of the Experiment Stations in 1941 Injections of ascorbic acid the pure form of Vitamin C, were found by the Wisconsin Station to be a practical method of rejuvenating impotent bulls and promoting pregnancy in cows which had failed to conceive before treatment.

Fluorine in well water and other water supplies used for drinking and cooking has been found by the Arizona Station to be the main cause of mottled teeth and means for removing this element have been worked out. Only small amounts were found in vegetables and other foods raised on soils containing this element, but it was absorbed on cooking in fluorine-containing water. Milk from cows drinking such water carried only a harmless trace. These findings point the way to greater safety for those living in communities with water supplies containing excessive fluorine. (*Exp. Sta. Rec. August 1942.*)

White wash which lasts Common lime wash, made by slaking freshly burnt lime and diluting it with water, is often found to be friable when dry and rubs or flakes off rather easily. Effort has, therefore, long been directed to the discovery of a method of preparation which will make the coating more resistant to rubbing, less liable to flake off, and having some waterproofing qualities.

At the start, it should be said that a good deal of the flaking which occurs is due to new coats being put over previous applications which are practically already detached from their base, and merely require the slight "pull" caused by a succeeding coat to cause them to break. There is no known way of overcoming this condition other than removal by washing or scraping of the defective coating.

Ordinary lime-wash is made by slaking about 10 lb. of quicklime with 2 gallons of water. As an ordinary fixative, alum, 1 oz. to the gallon, will stop white-wash from rubbing off easily. Alternatively, the addition of flour paste. which, however, needs the further addition of zinc sulphate as a preservative to prevent mildew, may be tried.

A reliable recipe for interior use (walls, ceilings, etc.) is;—(a) 62 lb. (1 bushel) quicklime, slake with 15 gallons of water, and cover with sacking till steam ceases to rise. Stir occasionally to prevent scorching; (b) 2½ lb. flour, beat up in ½ gallon cold water, then add 2 gallons cold water, then add 2 gallons boiling water; (c) 2½ lb. common rock salt dissolved in 2½ gallons hot water. Mix (b) and (c), then pour into (a) and stir until well mixed. This produces a mixture of good brushing consistency, and is used in factories, being recommended to prevent easy ignition.

Where a weather-proof coating for use out-of-doors is required, the following is a recipe which should prove satisfactory:— Place one bushel of good fresh quicklime in a barrel with 20 lb. of beef tallow, slake with hot water (about 15 gallons added gradually so as not to "drown" the lime) and cover with sacking to keep in steam. When the lime has slaked the tallow will have disappeared, having formed a chemical compound with the lime. Dry earth colours (ochre, sienna, etc.) may be added before slaking if a cream or buff tint is desired. The mixture should be stirred occasionally, and thinned to easy-flowing consistency with clear water when cold.

"Lighthouse" whitewash, again suitable for exterior purpose, is made in the following way;— (a) 62 lb. (1 bushel) quicklime, slake with 12 gallons hot water, (b) 12 lb. rock salt. dissolve in 6 gallons boiling water, (c) 6 lb. Portland cement. Pour (b) into (a) and then stir in (c) and use at once.

Skimmed milk used in place of diluting water is sometimes advocated to increase the tenacity of the wash, and an old recipe for external colouring of farm building is:— Lime ½ bushel slaked with one gallon of milk and remainder of water; 1 lb. salt, ½ lb. zinc sulphate to withstand weather.

It has been found that an old cob-webby roof not easily accessible to brushing can be effectively cleaned by machine spraying with common white-wash (well strained) which will bring the dust and cobwebs down, so that a second application produces a reasonably clean, white finish. (*J. Jam. Agric. Soc. Jan. Feb. 1942*).

Research Items.

[illegible]—A promising source of tannin (*Diospyros peregrina*).

Tannin is one of the important vegetable products extracted from various plants like, wattle, cassia, gallnut, and myrobalan, and occurs in different parts such as, bark, fruits leaves etc. It is used principally for tanning of hides, in ink manufacture, dyeing and also in a few pharmaceutical preparations. There is of late an increasing demand for materials containing tannin.

Diospyros peregrina Gurke (Ebenaceae), known by different names as *Panichi* in Malayalam, *Panichikai* in Tamil and *Tumiki* in Telugu, is considered a good source of tannin. It is an ever green tree with dark green foliage and is common throughout India and Burma except the arid regions. It is also found distributed in Ceylon, Siam and the Malayan Peninsula, and is abundant in Bengal. A fairly good number of trees are found in South Malabar and Cochin State. The tree flowers from March to May and the fruits ripen by about December. The fruits are round and green when unripe and rusty yellow when ripe. A good tree gives about 1000 fruits and the full bearing starts by the eighth year. The tannin is reported to be present in the bark of the tree and more in the fruits. The high percentage of tannin of about 15 per cent in fruit pulp[1] which compares favourably with other tannin materials[2], suggests its adoption as a promising source of commercial tanning material.

The fruits are put to a variety of uses in South Malabar and Cochin State due to its tannin content. The viscid pulp of the fruit when green, is commonly used in caulking bottom of boats and as a glue. The decoction as well as the pulp of the green fruits are applied to fishing nets to resist the action of weather and sea water. The utilisation of the fruit decoction for processing and colouring of arecanuts is very common in certain parts of the West Coast and the fruits sell in some seasons at 4 to 6 annas per 100. It is also recorded that an infusion of the fruit is used as a gargle in apthae and sore throat The oil from seeds of immature fruits is said to be used for preparing curatives for dysentry and diarrhoea. A detailed investigation on the economic possibilities of this tree with particular reference to its tannin content is desirable.

Oil Seeds Section, Coimbatore,
16—2—43

C. T. Ittyachen

1. G. Watts—*Dictionary of Economic products of India*, Vol. III, p. 141 1893.
2. Luz Baens—Tannin from kernels of green betel nut *Philipp. J. sci.* 75, 363 1941

The Red Tamarind (*Tamarindus indica* Linn.)

Two different kinds of tamarind trees are recognized, distinguished mainly by the colour of the pulp of their fruits. The common tamarind has greenish-yellow pulp when green which turns into reddish-brown on fully ripening. The other kind has red pulp with smaller seeds and is more valued than the common sort and makes a very fine preserve. The young fruits of this variety are less flattened and more turgid than those of the common one. It is largely grown at Lucknow, Guzerat, Bijapur and other places in North India and is not commonly found in this Province. Stray plants, however, are met with at Tindivanam in the South Arcot District, Venkatachalampalli village in Darsi taluk of the

Nellore District and certain other places. It goes by the local name *Sampulian* at Tindivanam. Since this variety is said to yield more than the common one besides the superior qualities attributed to it, it may with advantage be extensively grown in this Province.

References.

Cooke, T. (1903) *Flora of Bombay*, Vol. I, p. 430

Roxburgh, W. (1832) *Flora Indica*, Vol. III, pp. 216–217

Watt, G. (1893) *Dictionary of the Economic Products of India*, Vol. VI, part 3, p. 408

The Herbarium, Agricultural Research Institute, Lawley Road, P. O., Coimbatore. 24th February 1943

K. Cherian Jacob

Hints for Bee-keepers.

For April

Pasturage and weather conditions tend to deteriorate during this month. Pollen is available only from maize and *Peltophorum ferrugineum.* The main source of nectar is the straggling flush of cotton, but the supply is augmented by avenue trees such as the Indian elm, rain tree *Crataeva religiosa* etc. The flowering of margosa, which usually occurs in March, may sometimes extend to this month. Strong colonies in favourable localities may gather and store honey, but there is a general deterioration in the breeding and foraging activities of the bees. As a result of the adverse factors the hive population tends to go down and in such colonies, the supers and the superfluous combs should be removed and stored carefully for the next season's use. Fairly large numbers of drones may still be present in some colonies and they should be eliminated by the use of the drone trap.

Honey is a thick syrupy fluid containing about 60 to 75% of readily assimilable sugars. In samples kept for a long time, one of the sugars—dextrose or glucose—separates out in the form of fine crystal and settles at the bottom as a hard mass. This process is called ' granulation ". If it is necessary, this can be liquified by keeping the containeer in warm water for a time. Some samples do not granulate easily. These can, however, be forced to solidify artificially by keeping the bottle at low and room temperatures on alternate days for about a fortnight. Honey is hygroscopic and as such is likely to absorb moisture from the air and ferment, if it is not bottled in airtight receptacles.

Honeys from different sources have their own individual colour, consistency and flavour. Cotton honey is yellow, thick with little or no distinguishing aroma. Honey from tamarind is reddish, thin, with a peculiar acid taste. Margosa honey is golden yellow and thin in consistency. The aroma of the flowers is easily noticeable even in the hives when the trees are in bloom. Plantain honey is almost crystal clear, very thick with a strong smell of the flowers. Bees also collect and store honey from animal sources such as plant lice, leaf hoppers etc. This is popularly known as ' honey dew ' honey. It is dark in color, thick with a taste like that of molasses and a disagreeable flavour.

Honey, in addition to its being an easily assimilable food and a wholesome sweet, is reputed to be a specific for numerous complaints such as colds, coughs, heart complaints, blood pressure, eye diseases etc. It is also said to be both an internal and external antiseptic. The importance of honey bees as cross-pollinating agents of flowers and the use of their stings as a remedy against rheumatism, arthritis etc., are too well known to deserve any special mention here.

M. C. Cherian and S. Ramachandran.

Crop and Trade Reports

Statistics—Crop—Sugarcane—1942—Third or final report The average area under sugarcane in the Madras Province during the five years ending 1940-41 represents 3·0 per cent. of the total area under sugarcane in India. The area planted with sugarcane in 1942 is estimated at 121,970 acres. When compared with the corresponding estimate of 112,110 acres for the previous year and the actual area of 109,527 acres according to the Season and Crop Report, the present estimate reveals an increase of 8·8 per cent and 11·4 per cent respectively. The estimate of the previous year was greater than the actual area by 2·4 per cent. The present estimate of area exceeds the second forecast by 5,580 acres. The excess occurs mainly in Vizagapatam, Kistna, South Arcot, North Arcot, Trichinopoly and Madura.

The crop suffered to some extent from insufficient rainfall in parts of the Province. The harvest has commenced. The yield per acre is expected to be normal in Tanjore, Madura, Ramnad and South Kanara and below normal in the other districts. The seasonal factor for the Province as a whole is estimated at 89 per cent of the average as against 92 per cent in the previous year according to the Season and Crop Report. On this basis, the yield is estimated at 3,068,300 tons of cane the *gur* equivalent of which is 328,230 tons as against 2,836,310 tons of cane with a *gur* equivalant of 309,280 tons according to the final figures of the previous year. The present estimates reveal an increase of 8 7 per cent in the case of cane and 6·1 per cent in the case of *gur* as compared with the previous year.

The wholesale price of jaggery per imperial maund of 82⅞ lb. as reported from important markets on 30th January 1943 was Rs. 14—13—0 in Cuddalore, Rs. 13—3—0 in Erode, Rs. 12—13—0 in Coimbatore, Rs. 12—2—0 in Mangalore, Rs. 11—8—0 in Salem, Rs. 11—0—0 in Adoni, Rs. 10—15—0 in Chittoor, Rs. 10-9-0 in Trichinopoly, Rs. 10—5—0 in Vellore, Rs. 9—14—0 in Cocanada and Rajahmundry, Rs. 9—7—0 in Bellary, Rs. 9—2—0 in Vizianagaram and Rs 8—4—0 in Vizagapatam. When compared with the prices published in the last report, i. e. those which prevailed on 7th December 1942, these prices reveal a rise of approximately 31 per cent in Coimbatore, 21 per cent in Bellary, 18 per cent in Chittoor, 9 per cent in Trichinopoly and 6 per cent in Vizagapatam and a fall of approximately 20 per cent in Adoni 8 per cent in Salem and 6 per cent in Cocanada, the prices remaining stationary in Vizianagaram, Rajahmundry, Vellore and Mangalore.

Statistics—Cotton—1942-43—Fourth forecast report The average area under cotton in the Madras Province during the five years ending 1940-41 represents 9·7 per cent of the total area under cotton in India. The area under cotton up to the 25th January 1943 is estimated at 2,127,900 acres. When compared with the area of 2,472,800 acres estimated for the corresponding period of last year, it reveals a decrease of 13·9 per cent.

196,900 acres have been reported as sown since the last December forecast was issued. This extent comprises chiefly + 158,500 acres under Tinnevellies including *Karunganni* in Coimbatore, +55,100 acres under Cambodia, +12,200 acres under Warangal and Cocanadas, −25 500 acres under Westerns, −5,000 acres under White and Red Northerns and + 1,600 acres under other varieties. The area sown in December 1942 and January 1943 is less than that sown in the corresponding period of the previous year by 54·9 per cent.

The decrease in area in the current year as compared with that in 1941-42 occurs in all the important cotton growing districts of the Province except in Guntur, Kurnool and Cuddapah.

The area under irrigated cotton mainly Cambodia is estimated at 272,800 acres as against 303 100 acres estimated for the corresponding period of the previous year, a decrease of 10 per cent.

Pickings of the *mungari* or early sown cotton crop in the Deccan are nearing completion. The yield per acre was below the normal due to drought. The crop was affected by drought in parts of Kistna, Guntur and the Deccan. The yield per acre is estimated to be normal in East Godavari, West Godavari, Salem, Coimbatore (irrigated cotton only), Ramnad and Tinnevelly (Tinnevellies cotton only in each case) and Malabar. A yield per acre below the normal is estimated in other districts of the Province.

The seasonal factor for the Province as a whole works out to 81 per cent of the average as against 97 per cent in the previous year. On this basis, the total yield is estimated at 431 600 bales of 400 lb lint as against 563 800 bales for the corresponding period of the previous year. It is however too early to estimate the yield with accuracy as the harvest has not yet commenced in the major portion of the area and much will depend upon the future weather conditions and the toll taken by insect pests.

The estimated area and yield under the several varieties are given below:—

(Area in hundred of acres, i. e. 00 being omitted; yield in hundreds of bales of 400 lb lint i. e., 00 being omitted).

Variety.	Area from 1st April to 25th January. 1942-43. Acres.	1941-42. Acres.	Corresponding yield. 1942—43. Bales.	1941—42. Bales.
Irrigated Cambodia	2,588	2901	1594	1813
Dry Cambodia	2 836	3208	567	675
TOTAL CAMBODIA	5,424	6109	2141	2488
Uppam in the Central districts	216	217	31	35
Nadam and Bourbon	330	330	16	17
TOTAL SALEMS	546	547	47	52
Tinnevellies*	4 865	6810	1206	1714
White and Red Northerns	1 800	1400	158	170
Westerns	7 385	8700	540	1002
Warangal and Cocanadas	1,182	1082	203	202
Chinnapati (short staple)	77	80	9	10
TOTAL	21,279	24 728	4304	5638

* Includes *Karunganni* cotton grown in the Coimbatore district and *Uppam*, *Karunganni* and mixed country cotton grown in the South.

The average wholesale price of cotton lint per imperial maund of $82\frac{2}{7}$ lb. as reported from important markets on the 6th February 1942 was Rs 29—10—0 for Cocanadas, Rs. 30-14-0 for White Northerns, Rs. 23-14-0 for Red Northerns, Rs. 28-13-0 for Westerns (*mungari*), Rs. 25-15-0 for Westerns (*Dhingari*), Rs. 58-13-0 for Coimbatore Cambodia, Rs. 4[illegible]-10-0 for Coimbatore *Karunganni* and Rs. 35-7-0 for *Nadam* cotton. When compared with the prices published in the last report, i. e., those which prevailed on the 11th January 1943, the prices reveal a rise of

about 9 per cent in the case of Cocanadas, four per cent in the case of Red Northerns and Westerns (mungari) and three per cent in the case of White Northerns and a fall of about 4 per cent in the case of *Nadam* cotton and one per cent in the case of Coimbatore Cambodia and *Karunganni*, the price remaining stationary in the case of Westerns (*hungari*).

(*Additional Joint Secretary, Board of Revenue, Madras*).

Cotton Raw, in the Madras Presidency The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February to 5th March 1943 amounted to 23,422 bales of 400 lb. lint as against an estimate of 393,900 bale of the total crop of 1942–43. The receipts in the corresponding period of the previous year were 21,981 bales. 47 120 bales mainly of pressed cotton were received at spinning mills and 140 bales were exported by sea while 30,050 bales were imported by sea mainly from Karachi and Bombay.

(*Director of Agriculture, Madras*).

Moffussil News and Notes

Madura The American College Rural Service Extension Board, Madura, celebrated the Annual Rural Conference for student workers on the 13th January 1943. The Village Day Celebration and Rural Service Exhibition were held at the College Rural Centre, in Melamadai village, Madura taluk The Agricultural Department took part in the celebration by arranging an agricultural show and delivering lectures on increasing food production. The exhibition was opened by Sri C. Vedachalam, B.A, B.L.

Palni The Agricultural Association at Manur, Palni taluk, Madura district, celebrated its first anniversary on the 23rd February at Manur, Rao Bahadur I. T. Oblakondama Naicker, Zemindar of Ayakudi presiding. The function was a grand success. Besides all the local officers at Palni, *ryots* nearly a thousand in number were present during the occasion and took part in the function. The District Lecturer, National War Front, Madura, with the Bomber Van was also present. The Agricultural Exhibition was put up for two days in a specially decorated pandal, where the various improved strains of paddy, millets and other seeds, specimen crops of green manure, fodder, etc. were exhibited.

Vizianagaram The 13th Vizagapatam District Agricultural Exhibition was held at Vizianagaram between 21st and 23rd January, 1943 in the Samasthanam Officers' Association premises. This is the first of its kind held here, though the activities of the Department are in progress for the last score of years. The exhibition was opened by the Collector. The variety of exhibits specially from *ryots* of the district were superb and won the appreciation of all visitors. There were not less than 2,000 exhibits from *ryots* concerning all kinds of agricultural produce, cereals, pulses, oil seeds, fibre crops fruits, vegetables, (English and Indian), fruit preserves, dairy products, honey samples and cottage industries such as rope making, and mat making and live stock including poultry etc. The improved furnaces, specimens of green manure crops of *daincha*, sunnhemp, indigo and *pillipesara*, live colonies of bees and practical demonstration of extracting honey and posters on 'Grow More Food' formed the special features of the exhibition.

Koilpatti An attractive agricultural exhibition and cattle show was held at Kalugumalai during the *Thaipoosam* festival between 25th to 31st January 1943. This is one of the biggest cattle fairs in this district where nearly 14 000 cattle from all parts of the Presidency are brought. The prices of bulls ranged from Rs. 200 to 300 per pair and even fancy prices of Rs. 400 to 500 were offered. Opportunity was taken of during this occasion as in previous years, to exhibit

the various kinds of improved strains of implements and advocated by the Department. The various posters recently published by the Department were also put up in conspicuous places.

Tiruchendur An Agricultural Exhibition on a big scale was conducted at Tiruchendur on the occasion of the *Masi* festival of the local Subramania Swami temple from the 15th to 28th February 1943.

Pulivendla An Agricultural Exhibition was held in Putrayanipeta, Pulivendla taluk on 23rd and 24th February '43 on the occasion of the Annual Harvest Festival. The exhibition attracted large crowds. Improved strains of paddy, millets, green manure, and other garden and dry land crops, combed specimens of cotton varieties etc. were on show Various appliances, including fungicides and insecticides for control of plant diseases and pests were also on show. Improved implements were exhibited and demonstrated.

Estate News and Notes.

Students' Club Day The Thirty-fourth Annual Club Day was celebrated on Saturday, the 6th March with great success. The chief guest and president of the occasion was Sri R. M. Savur, B A. (Cantab). The sports in connection with the Day had been concluded earlier. The evening function began with Tea at 5-15 P. M. The fancy dress competition provoked mirth and amusement and was appreciated by all. After tea the guests and students assembled in the tastefully decorated Freeman Hall where the further proceedings were held. The reports on the literary and games activities were read by the respective secretaries. The prizes for winners in the literary competitions and sports were distributed by Mrs. R. M. Savur. This was followed by a fine and amusing variety entertainment. Later the President delivered his valedictory speech. The function came to a happy and successful close with the vote of thanks proposed by Sri C. R. Srinivasa Ayyangar, Principal and President, and by the Secretary.

Games—Tennis In the Cecilwood Tennis Singles Tournament. Sri P. Seshagiri Rao of class I came out successful in the finals defeating Sri M. Suryanarayana Sastry of class II.

Agricultural College Hostel Day Celebration The Hostel Day was celebrated on the 4th March for the first time this year, the 34th year of the existence of the Hostel, under the Presidency of Mr. C. R. Srinivasa Ayyangar, Principal of the College. There were several interesting items of sports and competitions, viz, the inter-mess *Iddati* competition, the Inter-mess Tug of War, the Inter-mess Relay race, and the Inter-mess *Chidugudu*. The first and last items evoked keen competition Another important item was 'Tree Planting'. A few sapota, pomello and curry-leaf plants were planted by the President.

The outgoing students The students of the final year and short course were entertained at Tea on 17th March by the students of class I and II.

Farewell On the 8th March, Sri T. Venkataramana Reddy, B.Sc. (Ag.), M.Sc. Assistant in Botany was entertained at a Farewell tea on his appointment in the Rubber Scheme. At the same function Sri S. V. Parthasarathy, B. Sc. (Ag.) M. Sc. the new Assistant in Botany was welcomed.

Estate Scouts The Ramakrishna Scout Group celebrated "Parents' Day" on the 13th March before a very large gathering of ladies and gentlemen of the Estate. Mr. M. C. Cherian, Government Entomologist, presided. Messrs. M. A. Sankara Ayyar and V. Gomathinayakam Pillai spoke in appreciation of the work of the Group. The displays given by scouts and cubs were much appreciated.

The sixth annual Honey Week celebration and Bee keeping exhibition. Coimbatore Dr. C. F. Scudder, District Medical Officer, Coimbatore, inaugurated the sixth Honey Week celebration and opened the exhibition connected with it on Friday, the 5th March, 1943, at the Government Training School for Mistresses, Rajah Street, Coimbatore, in the presence of a large audience. The Government Entomologist in welcoming the guests spoke about the large scope that bee-keeping has as a cottage industry and traced the development of the industry in the Presidency for the last six years. Dr. Scudder in his introductory speech stressed on the value of honey as food and in medicine. Sri S. K. Venkataramaier, B. A., L. T., Headmaster, Government Higher Elementary Training School, in a short speech gave his experiences as a practical bee-keeper and spoke about the educative value of bee-keeping. The president then distributed certificates of merit to a few private bee-keepers who exhibited their hives. The members of the Entomological section staged a small farce in tamil depicting the various phases of bee-keeping. With a vote of thanks proposed by the Assistant Entomologist, Sri T. V. Subrahmania Ayyar, the function came to a close. The exhibition was kept open till Monday next and attracted a large number of visitors every day.

Lecture on Indian Air Force On the 17th March the Air Force Technical Recruiting Officer, Coimbatore delivered a lecture on the Indian Air Force in the College hall in the presence of a large gathering of students and officers.

Departmental Notifications

Gazetted Service—Appointments

On return from leave Sri A. Gopalan Nayar to resume his post as D. A. O. Calicut. Sri K. K. Raghavan, D. A. O. Calicut to be D. A. O. Mangalore. Sri T. K. Balaji Rao, Asst. Paddy Section is appointed to act as Asst. Paddy Specialist, Coimbatore.

Leave

Sri U. Vittal Rao, D. A. O. Mangalore l. a. p. for 2 months from the date of relief.

Subordinate Services - Appointments

The following officiating appointments of Upper Subordinates are ordered to take effect from 8—3—1943.

Muhammad Baig Sahib, F. M. Anakapple. S. M. Muhammad Suliman Sahib, Asst. in Fruits, College Orchard, Coimbatore. P. A. Muhammad Ibrahim Sahib, Asst. in Mycology, Coimbatore. K. Fazlullah Khan Sahib A. D. Palladam, Sri T. S. Francis, Asst. in Mycology, Coimbatore. Sri D. Daniel Sundara Raj, Asst. in Botany, Coimbatore. Sri D. Isaiah, A. D Trivellore. Sri V. Mahimai Doss, F. M. Central Farm, Sri M D Azariah, F. M. Nanjanad. Sri G. Rama Rao, Asst. in Fruits, Kodur. Sri H. Gurubasava Raj F. M. Siruguppa. Sri A. Adivi Reddi, A. D. Rajampet. Sri K. Mahabala Shetty, A. D. Kudligi. Sri K. Rajaratnam Chetti F. M. Siruguppa. Sri K. Rama Mohan Rao, F. M. Samalkota. Sri B. Narayana Reddi, A. D. Kalahasti, Sri G. Ramalingam, A. D. Darsi (Nellore Dt.) Sri A. Subba Raju, F. M. Guntur. Sri T. D Muthuswami, A. D Siruguppa. Sri V. Gopalakrishna Gokhale, A. D. Krishna Dt. Sri M. Narayanan Nambiar, F. M. Nileshwar. Sri K. Sheenappa, F. M. Nileshwar. Sri M. V. Bhaskara Rao, A. D. Kaikalur. and Sri B. Padmanabha Raju, F. M. Anakapalle.

Promotion

Sri J. S. C. Antony, Asst. A. D. Vth grade to IV grade with effect from 7th October 1942.

Transfers

Sri Rajaratnam Chetti, A. D. Palladam as A. D. Ootacamund. Sri K. Raman Menon F. M. Nileshwar as A. D. Coonoor Sri M. Subramania Chetti, F. M. Hagari as A. D. Rasipuram. Sri N. Rama Doss Pantulu, F. M. Nandyal as A. D. Kaikalur. Sri P. Narayanan Nair, F. M. Taliparamba as Asst. in Fruits Taliparamba. Sri K. P. Sankunni Menon, A. D. Cheyyar as F. M. Taliparamba. Sri G. Narasimha Murthy F. M. Siruguppa as A. D. Hospet. Sri A. Subba Rao A. D. Hospet as Asst. in Fruits, Anakapalle. Janab A. Abdul Sammad, Asst. in Paddy, Coimbatore as Senior Asst. Aduthurai Sri V. Srinivasan, Asst. in Paddy, Aduthurai as Asst. in Paddy. Coimbatore. Sri B N. Padmanabha Ayyar Off. Asst. in Paddy. Coimbatore to Pattambi. Sri M. Vaidyanathan, A. D. Madkasira as A. D. Special duty Octacamund. Sri R. Soundararajan F. M. Central Farm as A. D. Podanur. Sri M. V. Narasimha Sastry, F. M. Samalkota as A. D. Chodavaram. Sri P. Nagadhara Naidu, F. M. Nandyal as F. M. Hagari. Sri G. Kameswara Rao, F. M. Anakapalle as A. D. Tadepaliigudam. Janab K. Fazlullah Khan Sahib, A. D. Palladam as Asst. in Fruits Coimbatore. Sri A. Shanmugasundaram, F. M. Koilpatti as A. D. Coonoor.

Leave

Sri P. S. Suryanarayana Ayyar, A. D. Tanjore, l. a. p. for 2 months from 5-3-43. Sri S. M. Kalyanarama Ayyar, Asst. in Cotton, l. a. p. for 1 month from 1-3-43. Sri B. L. Narasimhamurthi, Millet Asst. Anakapalle, l. a. p. for 30 days on m. c. Sri R. Alagiamanavalan, A. D. Punganur, l. a. p. for 45 days from 15-4-43. Sri K. Kondayya Sarma, A. D. Polavaram, l a. p. for 3 months on m. c. from 24-1-43. Sri P. Krishnaswami, Asst. Millet section, l. a. p. for 1 month from 7-3-43. Sri R. Guruswami Naidu, A. D. Proddattur, extension of l. a. p. for 2 months and half average pay for 2 months from 8-2-43. Sri K. S Ramana Rai, A. D. Hospet, l. a. p for 1 month from 21-3-43. Sri M. C. Krishnaswami Sarma, F. M. Palur, l. a. p. for 1 month from 5-4-43. Sri P. V. Hanumantha Rao, A. D. Virdachalam, l a. p. on m. c. for 2 months from 28-2-43 Sri N. S. Rajagopala Ayyar, Asst. in Fruits, extension of l a. p. for 4 months on m. c. from 25-1-43. Sri S. Venkataraman, Asst. A. D. Nannilam, l. a p. for 2 months from 15-3-43. Sri B. G. Narayana Menon, F. M., l. a. p for 62 days from the date of relief. Sri M. P. Narasimha Rao, Cotton Asst. Nandyal. l. a. p. for 10 weeks on m. c. from 27-1-43 Sri M. Ratnavelu Gounder, A. D. Bhavani extension of l. a. p. on m. c for 1 month. Sri C. S. Namasivayam Pillai, A. D. (on leave) extension of l. a. p. without allowance for 3 months from 3-1-43. Sri K. Ambikacharan, A. D. (on leave) extension of l. a. p. on m. c. for 1 month from 7-3-43.

ANNOUNCEMENT

The Ramasastrulu-Munagala Prize, 1943.

1. The prize will be awarded in July 1943.

2. The prize will be in the form of a Medal and will be awarded to the member of the Union who submits the best account of original economic enquiry, carried out by him on any agricultural subject.

3. The subject matter shall not exceed in length twelve foolscap pages, type-written on one side.

4. Intending competitors should notify the Secretary of the Madras Agricultural Students' Union, not later than the 15th May the subject of the paper which they propose to submit, and the paper should be sent in so as to reach him not later than the 1st June 1943 with a covering letter showing full name and address of the sender. The author's name should not be shown on the paper, but should be entered under a *nom-de-plume*.

5. Four type-written copies of the essay should be sent.

6. The name of the successful competitor will be announced and the prize awarded at the time of the Conference in July.

7. Papers submitted will become the property of the Union and the Union reserves to itself the right of publishing all or any of the papers.

8. All reference in the paper to published books, reports or papers by other workers must be acknowledged.

9. Any further particulars may be obtained from the Secretary, Madras Agricultural Students' Union, Lawley Road P. O., Coimbatore.

S. V. DURAISWAMI AYYAR,
Secretary.

The Madras Agricultural Journal

(ORGAN OF THE M. A. S. UNION)

Vol. XXXI APRIL 1943 No. 4.

EDITORIAL

Fertilizer situation in India The increased demand for fertilizers that has arisen as a result of the inauguration of the Grow More Food campaign, has created a difficult situation. The problem has become rather acute during recent times as the import of artificial fertilizers which amounted to about 100,000 tons annually during pre-war times has almost ceased and India'a output which is very much limited cannot meet the growing demand to any tangible extent. With the phenomenal increase in the price of all agricultural commodities and more especially of the commercial category, farmers are eager to increase the output of all crops and thereby derive greater profits from their lands. They readily resort to a more liberal application of manures to their lands than they were accustomed to during the depression days of the pre-war period and vie with one another in procuring all available stock. Due to this increased demand and short supply, the prices of all artificial manures and their indigenous substitutes have sky rocketted and made them almost out of reach of the small cultivator.

In England, it is reported that to ensure adequate supplies of fertilizers to all farmers alike, restrictions tantamount to rationing have been imposed and advice given on the economic doses to be applied to particular crops, so that each farmer may draw up his fertilizer programme and stock only the required quantity. While it is difficult to lay down such a policy for a country like India, in view of the varying needs of individual crops and soils, we suggest State intervention in guaranteeing adequate quantities of the required fertilizers to crops whose quality or yield is known to be definitely dependant on the application of fertilizers. For this purpose it is necessary to provide facilities to import larger consignments and enhance internal production by encouraging the few concerns that have been started in this country, by making available to them the necessary raw materials. The war has profoundly disturbed the equilibrium of agricultural production all the world over and any increase in the output of food and other essential requirements should be treated as a war effort of the highest magnitude.

Side by side with the drive for increasing the output of artificial fertilizers, efforts should also be made to enhance the availability of all organic manures and conserve and use them on scientific lines. The lack

of export trade in oilseeds which cast a gloom over the country at the beginning of the war has turned ultimately to the benefit of India as it has developed the local oil crushing industry and made available to her agriculture the valuable oil cake which is a rich source of organic nitrogen and an excellent substitute for ammonium sulphate.

Cattle manure which has been acknowledged all the world over to be the best manure for almost all crops is indifferently collected and stocked or burnt away as fuel. We have also seen how farm and town refuse and wastes are burnt away instead of being composted and turned back into the soil to supply the humus which is so essential for keeping up soil fertility. In order to avoid wastage of such potentially useful material, the Government of India have on hand a scheme for training a number of biochemists in the 'Bangalore process' of converting town refuse into manure; and to make such persons available for service in the Provinces and States. It is hoped that the various local authorities will co-operate whole-heartedly in this effort of organising on a large scale the composting of all refuse to produce "wealth from waste" and aim at a larger production target as an essential auxiliary to the Grow More Food campaign.

The World Conference on Food Stuffs The recent announcement in the press that the Government of India have deputed Mr. P. M. Kharegat, I. C. S., Vice Chairman of the Imperial Conncil of Agricultural Research, and Dr. W. R. Aykroyd, Director of Nutrition Research, as their representatives to the World Conference on Food Stuffs, to be held in May 1943 in the U. S. A. is to be welcomed. The conference is to discuss postwar problems connected with food stuffs and other essential agricultural products, including problems of nutrition. The representatives will be joined in America by the Agent General, Sir G. S. Bajpai and India's Trade Commissioner, Mr. H. S. Malik. We hope that the conference will pave the way for planning Indian Agriculture on proper lines so as to produce a sufficient supply of the requisite type of crops and other food materials to give its people a satisfying and nutritious dietary.

The Madras Provincial Agricultural Association We are glad to learn, and to bring to the notice of our readers, the formation of an association of persons interested in the agriculture of the Province. The subscribers to the memorandum comprise prominent landlords from different parts of the Province. Sri B. Ramachandra Reddi, C. B. E, Nellore, is the President and Sri D. Munikanniah, B.A., B.L., Madras, is the Secretary. The Aims and Objects of the Association cover a wide range of subjects pertaining to agriculture and rural problems. Such an association is a long felt need for a predominantly agricultural country like ours. The membership is open to *bona fide* agriculturists in the Madras Presidency. We hope that many of our readers who are agriculturists will enrol themselves as members and persuade other agriculturists to join the Association, and strengthen the cause of agriculture. Particulars may be had of the Secretary, The Madras Provincial Agricultural Association, Mount Road, Madras.

A New Variety of *Dolichos Lablab* and Its Economic Value

By K. KUNHIKRISHNAN NAMBIAR, B. Sc. (Ag),
Assistant, Millet Section, Agricultural Research Institute, Coimbatore

There are two varieties of *Dolichos lablab,* one the climbing variety commonly grown in the kitchen garden for its tender pods, and the other the field variety cultivated on the dry lands, as a mixture with millets and whose seeds only serve as a pulse food for man. The former is known as *Avarai* (Tamil) or *Chikkudu* (Telugu) and the latter as *Mochai* or *Anumulu.* These are similar to the "snap" and "shell" varieties in the pea[1] *(Pisum sativum)* and in the French bean[2] *(Phaseolus vulgaris).* Between the two varieties of lablab many marked differences exist, morphological as well as physiological, but those that concern the cultivator are :

	The Kitchen garden variety	*The field variety*
i.	Pod edible ; not fibrous	Pod not edible, fibrous ; seeds only can be used, ripe seeds as a pulse and unripe seeds as a vegetable
ii.	A typical climber ; requires '*pandals*' or other support	Bushy to sprawling in habit ; no support necessary
iii.	Needs frequent irrigation	A rain-fed crop
iv.	Heavy manuring necessary and constant attention essential during growth	A hardy plant that comes up well even on comparatively poor soils ; practically no care required after sowing

At the Millet Breeding Station, Coimbatore, where collections of both these varieties from almost all parts of the Madras province have been studied and numerous crosses between them have been made, it was observed that although the two varieties cross readily, the subsequent generations suffer from varying degrees of sterility. One of these crosses however was found to be fairly fertile. Its parents were D. L. 250, a fleshy, tasty and high yielding kitchen garden variety, and D. L. 231, a strain of the field variety. Continued selection in the progeny of this cross has resulted in D. L. 1428, a strain that combines the desirable qualities of both its parents and is at the same time as fertile as either of them[3]. Its pods are non-fibrous and as tasty a food material as some of the best varieties of the typical kitchen garden lablab. There is a slight trace of the smell of the field variety pod which is disagreeable to some, but this disappears on cooking.

This variety was grown for seed multiplication in a limited area (40 cents) last season, and to estimate its yielding capacity 100 rows, each 25

links long were marked out at random in this area and the green pods harvested at intervals. In all, eight pickings were taken and the harvests lasted from December to February. The yield as estimated from these rows amounted to 6,070 lb. of tender pods per acre (standard error=177 lb.). The approximate cost of cultivation per acre is given below:

	Rs.	As.	Ps.
Preparatory cultivation			
One ploughing with Victory plough (2 pairs, 2 men) ...	3	0	0
Wooden *guntaka* worked thrice ($1\frac{1}{2}$ pairs, $1\frac{1}{2}$ men) ...	2	4	0
Manures and manuring			
Cost of 5 cart loads of farm yard manure ...	10	0	0
Carting and spreading ($\frac{1}{2}$ pair, 2 men, 2 women) ...	1	14	0
Ploughing with the wooden plough ($1\frac{1}{2}$ pairs, $1\frac{1}{2}$ men)	2	4	0
Seed and sowing			
Cost of 10 lb. of seed @ Re. 1 per lb. ...	10	0	0
Sowing and covering (1 pair, 1 man, 1 boy) ...	1	12	0
Harvest			
Picking 6,000 lb. of green pods (120 women) ...	30	0	0
Cutting vines and removing (12 women) ...	3	0	0
Total	64	2	0
Income			
Price of 6,000 lb. of pods @ 4 pies per lb. ...	125	0	0
Profit ...	60	14	0

The harvest of the green pods is the costliest item of the cultivation bill. When the variety is cultivated on a small scale so that the members of the cultivator's household could attend to the periodical harvests, the cost under this head can be lessened and perhaps entirely saved. Similarly the cost of the seed can be saved by preserving the seed from the previous crop.

Summary By crossing the kitchen garden variety of lablab with the field variety, a new variety has been evolved which combines the desirable qualities of the two and yielding pods that are equal in quality to those of the typical kitchen garden lablab. It is a leguminous vegetable suitable for growing in dry lands and its cultivation is profitable.

Acknowledgment. My thanks are due to Sri C. Vijayaraghavan, Millet Specialist, for guidance in estimating the economic worth of this variety.

Literature cited.

1. Hedrick, U. P.—Peas of New York (Vegetables of New York, Vol. I, part 1), *New York Agri. Exp. Sta. Report*, 1928.
2. ,, — Beans of New York (Vegetables of New York, Vol. I, part 2), *New York Agri. Exp. Sta. Report*, 1931.
3. Rangaswamy Ayyangar, G. N. and Kunhi Krishnan Nambiar, K.—Lablab—the Garden Bean. *Indian Farming*, 2, 469—472, 1941.

A Short Note on the Cultivation of Elephant Yam
(*Amorphophallus campanulatus*)

By K. MEENAKSHISUNDARAM, B. Sc. (Ag.)
Agricultural Demonstrator, Tindivanam

Introduction When propaganda for reduction of area of commercial crops like groundnut and cotton is done, it is desirable that profitable substitute money crops, which are at the same time food crops also should be suggested to the *ryots.* The substitute crops should be those that can be cultivated by the ordinary *ryot* without much cultivation expenses and at the same time easily marketable. One such crop is Elephant yam. It is a nutritive 'root vegetable' which can he stored for a long time. Extension of cultivation of this will add to the vegetable production in the country and at the same time be profitable to the cultivator.

This crop requires about 10 months to mature. It is usually planted in *Chitrai* (April—May) and harvested in *Thai* (January—February). A profit of more than Rs. 400 per acre can be secured in normal seasons by growing this crop. It is an exhaustive crop and can be grown in rotation once in three years in wet lands or garden lands. A short note on its cultivation is given below.

Soil Loamy soils rich in organic matter are often preferred for cultivation of this crop. Stiff clayey soils or soils with *korai* grass or *pasali* weed are often avoided as weeds cause a lot of damage to the growth of the crop.

Preparatory cultivation About 10 to 12 ploughings are usually given with the wooden plough. Ploughing is commenced as early as March so that soil may be brought into good tilth. The use of iron plough will be economical as the number of ploughings can be reduced.

Manuring About 50 cartloads of cattle manure are applied per acre and covered with the plough. Paddy husk, dried leaves or *varagu* straw are also applied, as much as available, at the time of ploughing and these get incorporated in the soil.

Seed-material Selection of seed material is the important item of work and should be done carefully, from the last year's crop left unharvested for the purpose. Yam has a face or front portion with a number of rings over the face, with a projection in the middle. These rings are places where from future plants germinate. A big yam is cut into small bits in such a way that each bit gets at least a small portion of this ring or germinating portion. There are also caruncle like projections, which are tender shoots ordinarly called *Arumbu.* These are broken before planting, as they do not give vigorous growth. An ordinary sized yam gives about 6 to 8 bits for planting. 'Depressed head' yam is always preferred for seed purposes.

As a preliminary treatment the cut pieces of seed material are dipped in cowdung water so that the cut portions are coated with cowdung. This is said to prevent evaporation of moisture from the cut seed bits. About 5000 to 6000 lb. of seed material is required to plant an acre.

Ridges are formed with the plough 1½ feet apart, with irrigation channels for every 10 ft. of ridge. The seed material is distributed over the ridges and are planted on the sides of the ridges 1½ feet apart in the row. The ring portion is planted downwards towards the soil, and earthing up of soil is done immediately with the plough. Irrigation follows after earthing up of soil.

Irrigation The second irrigation is done three or four days after planting and subsequent irrigations are done once a week or whenever the field needs or gets dried up. The planting is usually done in April-May; earlier plantings always give a good yield. *Ryots* are careful not to flood the crop when irrigating as they believe that flooding reduces the yield of the crop. Water, on the other hand, is allowed to stand in the furrows up to half the height of the ridges. About 16 irrigations are given from May to October; the moisture requirement during the rest of the period is made good with the occasional receipt of rains.

Weeding This operation is done almost once a month during the growing period, or as often as necessary, and for the entire growing period about six weedings are done. Earthing up of soil with the plough followed by irrigation is done after every weeding.

The plant begins to form corms or tubers from September onwards, five months after planting and grows to a height of 4 to 6 ft. in 8 months. It takes about one to one and half months for complete germination. Off shoots spring up from main shoots, the first one appearing in 3 to 5 months after planting. The second one appears in October and the third one in November. After the springing of the third off shoot, the crop is supposed to be ready for harvest. When the crop is mature the leaves turn yellow.

Harvest The crop is usually harvested from January onwards according to the demand in the market. Harvesting earlier results in reduced yields. The harvesting operations consist of cutting away the shoot portion and lifting up the underground corms.

Each plant gives about 6 to 8 lb. of corms. The normal yield per acre is about 21,600 lb. (18 cart loads). The present price is Rs. 38 per cart load of 1200 lb. Thus the gross income from an acre is Rs. 684.

Economics The economics of cultivation of this crop of an ordinary *ryot* who cultivates 33 cents or ¼ *kanni*, which is the normal area cultivated per holding, is detailed below. This gives a clear margin of profit of more than Rs. 400 per acre.

	Rs.	As	Ps.
12 ploughings at 4 as. each	3	0	0
Cattle manure 12 cart loads at 10 as. each cart load ...	7	8	0
Spreading manure	0	4	0
Two ploughings for covering manure	0	8	0
Forming ridges and furrows	0	6	0
Cutting seed	0	4	0
Spreading seed and planting on the ridges	1	0	0
Earthing up furrows	0	12	0
First irrigation—3 men	1	0	0
Second irrigation	0	8	0
Subsequent irrigations—16 for 7 months (May to October) ...	11	4	0
Weeding 6 times and earthing up	6	0	0
Harvesting at 8 as. per cart load	3	0	0
	35	6	0
Cost of seed material 1600 lb. at Rs. 38 per cart load of 1200 lb.	51	0	0
Add assessment for 33 cents	3	15	0
Total expenditure ...	90	5	0
Yield—6 cart loads or 7200 lb.			
Value—Rs. 38 per cartload (1200 lb.)	228	0	0
Net profit for 33 cents or $\frac{1}{4}$ *kanni*	137	11	0
Net profit for one acre	413	0	0

The yield taken is normal and it goes up to 10 cartloads depending upon manuring and field conditions

Preliminary Trials with *Trichogramma* Parasites for the Control of the Cotton Boll Worms

By M. C. CHERIAN & V. MARGABANDHU,
Agricultural Research Institute, Coimbatore

Introduction Species of *Trichogramma* are well known egg-parasites used extensively in biological control of some of the major pests of crops the world over. Their distribution is world-wide and their range of hosts varied, comprising several orders and families. Their life-cycle is short and they can be bred in very large numbers with comparatively little cost. The breeding technique is simple and manipulation of the parasites in the field easy.

These parasites have come into prominence since the time of their being used against the sugarcane borer *Diatraea saccharalis* (Fabr.), one of the most serious pests of sugarcane in many of the American States, West Indies, Hawaii etc. They are also used in the control of the codling moth *Cydia (Carpocapsa) pomonella* (L); the Oriental fruit moth *Cydia (Grapholitha) molesta* (Busck); and the European corn-borer, *Pyrausta nubilalis* Hbn. in America. In Russia they are used extensively against the American

boll worm of cotton *Heliothis armigera* Hbn., the oriental fruit moth *Cydia (Grapholitha) molesta* Busck and the cabbage pest *Barathra brassicae* L. In Africa they are used in the control of the American cotton boll worm *Heliothis armigera*. In India no attempt has so far been made in the liberation of these parasites for the control of crop pests except the sugar-cane borer in Mysore (Subrahmanyam 1937).

The two commonly known species of *Trichogramma* are *T. minutum* (Riley) and *T. evanescens* Westw. The validity of their being styled as distinct species is doubted and the opinion seems to gain ground that these are two races of one and the same species. Till this is settled by systematists, the one referred to in this paper will be termed *T. minutum* (Riley). It has so far been obtained in nature from eggs of the sugar cane borers *Argyria sticticraspis*, and *Diatraea venosata* and the paddy stem-borer *Schoenobius incertellus*. Hussain and Mathur (1923) record it on *Earias* eggs. This paper gives an account of the *Trichogramma* parasite liberation work done at Coimbatore during the season 1941—42 in the control of the two cotton boll worms *Earias* and *Platyedra*.

Laboratory Studies 1. On *Earias fabia* eggs. Series of experiments were devised to obtain information on the life-cycle of *Trichogramma* parasites, effect of age of host on the degree of parasitism, number of parasites that emerge from a single host etc.

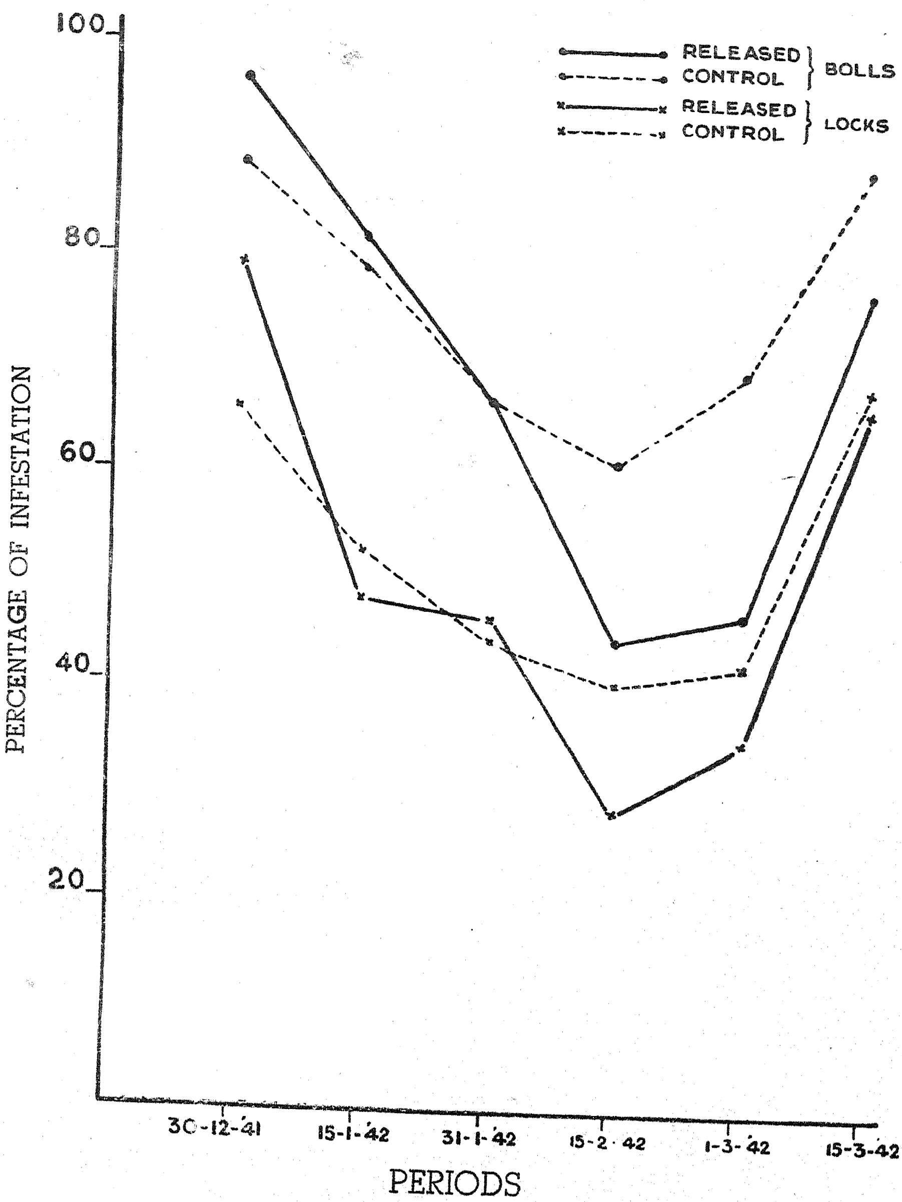
Degree of parasitisation and age of host eggs Out of 23 trials with one-day old eggs in 14 cases there was 100 % parasitisation and in 3 cases 75 %, 78 % and 98 %. In the case of two-day old eggs, for a total of 14 trials there was complete parasitisation in seven cases and in 3 cases 75 %, 87 % and 87 %. In 3 days old eggs out of 7 trials there was complete parasitisation in 3 cases and in 3 other cases 60 %, 95 % and 95 %.

Preferential oviposition on host eggs of different ages Host eggs — one, two and three days old — were given to one lot of parasites in one container and the degree of parasitism for one, two and three days old eggs in one trial was 100%, 59% and 71% respectively; and for the second trial it was 83%, 86% and 100% respectively. Thus it is possible to get high degree of parasitisation irrespective of the age of the host egg.

Number of parasites that emerge from a single host egg Individual parasitised eggs were put in tubes to see the number of parasites emerging out of a single egg. Out of the 13 cases under observation, in 7 there was one parasite per egg and in 6 two per egg.

Duration of life-cycle of the parasite from egg to adult within the host egg The duration of life-cycle has been found to vary from 6 to 9 days based on initial emergence, 6 being very rare. The average works out to 8 days for 55 trials.

The period of maximum emergence from host eggs In most cases the maximum occurs either on the first or the second day and the emergence itself is almost complete during these two days.



CURVES SHOWING THE INCIDENCE OF BOLL WORMS IN PICKED BOLLS AND LOCKS IN TRICHOGRAMMA LIBERATED AND CONTROL FIELDS, 1941-'42

Egg-laying capacity of parasites In one case the female lived for 11 days and laid 125 eggs, the average per day being 11 eggs. The maximum number of eggs laid in a day was 20 as judged by the number of parasites emerging from the host eggs. In another case where the female lived only for 8 days the maximum number of eggs laid in a day was 53.

2. *On Platyedra gossypiella eggs* The percentage of parasitism for 8 trials is as follows:— 20, 38, 60, 63, 67, 75, 85 and 96. The duration of life-cycle is nearly 7 days Out of 51 parasitised eggs of *Platyedra* kept in individual tubes in all the cases only one parasite was got from each egg.

Field studies *Material and methods* Eight cotton fields sown during August—September on the Central Farm, Coimbatore, were selected for the experiments. In four fields half-acre blocks were marked centrally and parasites liberated at various points to uniformly cover the whole area. Four other fields served as control. The liberations were done once in four days at 5000 parasites per half acre per release. The liberations commenced from 17th December 1941 and were carried to the end of February 1942 till the completion of the first flush. There were 18 liberations in all. In order to note the effectiveness of the liberations, burst bolls were collected from treated and control plots and examined for boll worm infestation. In this way 80,947 burst bolls comprising 325,218 locks were examined. The parasites for release were bred in the laboratory from *Corcyra cephalonica* eggs.

Results of trials The incidence of attack in the treated (released) and control fields is given for fortnightly intervals in the statement and curves appended. It will be seen (i) that the incidence of attack is appreciably reduced during February, (ii) at one period the reduction in the percentage of attack of bolls by the release of parasite is as high as 22% (vide statement) and (iii) the effect of release is seen both in the bolls and locks.

Statement showing the fortnightly incidence of the boll worms in the picked bolls and locks in released and liberated fields.

			Total examined.*	Total affected.	Percentage of incidence.
BOLLS	Released.	30-12-41	1228	1179	96
		15-1-42	3320	2716	82
		31-1-42	5708	3769	66
		15-2-42	13271	5857	44
		1-3-42	10219	4749	47
		15-3-42	3943	3021	77
	Control.	30-12-41	1462	1297	89
		15-1-42	2540	1998	79
		31-1-42	12988	8506	66
		15-2-42	11933	7220	61
		1-3-42	10325	7076	69
		15-3-42	4010	3574	89

LOCKS	Released.	30-12-41	5154	4061	79
		15-1-42	13308	6441	48
		31-1-42	22778	10415	46
		15-2-42	54752	15179	28
		1-3-42	41080	14221	35
		15-3-42	15488	10282	66
	Control.	30-12-41	6269	4151	66
		15-1-42	10765	5574	52
		31-1-42	53092	23157	44
		15-2-42	47428	18925	40
		1-3-42	49635	16617	42
		15-3-42	15469	10544	68

* The figures represent the total of the 4 released and 4 control fields.

Acknowledgments The authors wish to thank Sri Y. G. Krishna Rao Naidu, Superintendent, Central Farm, Coimbatore, for affording facilities for the experiments and Sri S. N. Venkataraman, Assistant Marketing Officer, for going through the data.

References

Hussain M. A. & Mathur. U. B. (1923). *Rep. Proc. 5th Ent. Meeting, Pusa, 1923.*
Subrahmanyam, T. V. (1937). *Indian J. Agri. Sci.* 7, 149—155.

SELECTED ARTICLES

Some Biological Discoveries of Practical Importance*

By Dr. C. H. WADDINGTON

There are two main spheres in which biology is of practical importance to society. One is medicine in the widest sense, which it would perhaps be more accurate to call human biology, and the other is food production or agriculture, also in the widest sense.

I do not propose to discuss the first of these fields in any detail, although new discoveries and new applications of old discoveries are always being made. Among recent new discoveries one may perhaps mention the bacteriocidal and bacteriostatic substances which are now being obtained from lower organisms. Penicillin, extracted from a mould related to the ordinary bread mould, is being investigated at Oxford and elsewhere and seems likely to prove one of the most powerful aids in dealing with infected wounds, a matter of the greatest importance at the present time. It may, however, be rivalled by gramicidin, a substance prepared by American workers from certain types of bacteria which grow in soil; but perhaps the more optimistic view will prove justified and the two substances be found to attack rather different kinds of germs and thus to supplement each other. As an example of a new technique of utilizing old biological knowledge, one may mention the treatment of various diseases, chiefly cancer in some of its forms, by radio-active substances artifically prepared with the aid of new physical apparatus such as the cyclotron. Radio-phosphorus and radio-iodine are differentially absorbed by different tissues in the body; their radio-activity causes the destruction of the tissues in which they become located and the surgeon can in this way bring about a localized inhibition of particular tissues which are proliferating too rapidly.

But the great tasks of medicine in the immediate future are concerned with the application of knowledge which we already possess. These tasks can be

* Substance of a lecture delivered at the Royal Institution on Feb. 12, 1942.

summarized under three heads; first, the attainment in practice of optimal standards of nutrition, of housing, of industrial hygiene, and so on; secondly, the conquest of tropical diseases and the improvement of the health of tropical populations until they have an equal chance with the peoples of the temperate zones to play their part in world civilization, and thirdly, a task in which social biology must collaborate with political and other agencies, is the reversing of the general fall in the reproductive rate in industrial countries. New discoveries may, and very probably will, be made which will assist in the carrying out of these tasks, but the main problems are certainly the administrative and political ones of applying existing knowledge.

When we turn to the field of food production we find a great body of existing knowledge which is in process of being put into practice. Such developments of farming practice as the system of ley farming and the increased use of silage are examples. But there are also a number of biological discoveries which may have very revolutionary effects on the whole of our food production system, and it is primarily a summary of these more far-reaching possibilities that I propose to discuss.

We may mention first some new uses for old crops. Straw is bound to be produced in large quantities along with any cereal crop, but, except for some oat straws, it is itself of little value for feeding animals. It has recently been shown that a treatment with caustic alkali breaks down the hard tissues of the straw sufficiently to allow of its being digested by cattle, and a very considerable new source of feeding stuffs has thus been placed at the farmer's disposal. A more striking innovation would be the direct use of grass protein for human consumption. Grass is much our biggest crop: we produce about 60 million tons a year. It is too full of indigestible fibre to be eaten by man in the raw state, and the methods by which we use it are still those which were invented in the Stone Age; we feed it to cattle and sheep and ourselves eat the beef, mutton, milk, etc., which they produce. They can, it is true, digest the fibres with which the human intestines cannot deal, but they are relatively inefficient in making use of the proteins. Now it is comparatively easy to grind up the grass and squeeze out some 30 per cent of the protein for our direct use. The remainder of the protein remains with the fibres, the whole mass still representing a better cattle food than ordinary hay. The technical problem of making the grass protein into a really attractive and palatable product should not long remain beyond the capacities of our biochemists. When it is pointed out that the total quantity of grass protein grown in Great Britain is something like ten times our normal protein requirements, the potential importance of the direct utilization of even a small fraction of it requires no further emphasis; but the economic and agricultural problems of employing the process on a large scale require further study.

Let us consider now some new technical possibilities in the cultivation of our crops. Much publicity has been given recently to tank culture or hydroponics. By this is meant the cultivation of plants in culture solutions the concentration and composition of which can be accurately controlled. Such methods are, of course, by no means innovations in the laboratory; it is only their utilization on a large scale for commercially grown greenhouse crops which would be a new departure. It does not, however, seem by any means certain that this technique has any great advantages, at least in the climate of Great Britain, over the method of soil sterilization which was introduced some years ago and is now becoming very widespread.

Another technical innovation from which much can be expected is the use of the recently discovered plant hormones. Knowledge in this field is still growing

rapidly but we already understand something of the part played in the growth of a plant by very small quantities of certain essential substances, some of which are in fact identical with the vitamins which we hear so much about in our own diet. Some of the hormones are already quite widely employed to encourage the rooting of cuttings: but there are many more possibilities emerging in the laboratories of the world—for example, the growing of long-fibred stems in textile plants such as flax and hemp, the production of seedless fruits from unpollinated flowers treated with suitable hormones, the controlling of the opening of flower buds until the danger of severe frost is past, and so on. Moreover, new hormones are still being discovered, some, such as a new pollen extract recently described by the United States Department of Agriculture, controlling growth, while others are concerned with various other phases of a plant's development.

These studies have not yet been brought into relation, although they soon must be, with another very important development which has arisen in practical crop management. Russian biologists in particular have devoted great attention to the investigation of the time of ripening of plants with the view of developing types which can either survive their rigorous winter or which can crop in a single year after planting in the spring. They have developed a rather elaborate theory of the succession of various phases in a plant's development, which they distinguish sharply from its growth. In general a plant first passes through a temperature phase, in which it requires a certain length of exposure to particular low or high temperatures; this, they claim, is succeeded by a light phase, in which the plant must be subjected to particular conditions of long or short daily periods of illumination. The practical application and indeed the practical basis of this theory is the technique known as vernalization, in which the germinated seeds are artificially given the treatment needed to complete the first phase of development before being sown. Thus a winter variety of wheat, which is normally sown in autumn and lies in the ground over winter, starting to grow in the following spring, may be artificially cooled for the required time and then planted in the spring to crop in the same year. Such methods would be of some value even in England and may be of very great importance in countries with the severe climatic conditions of Soviet Russia, where many million acres have been sown with vernalized seeds. Workers in other countries are not so convinced of the practical value of the method, and the details of both theory and practice are still under discussion. But there seems little doubt that the basic phenomena are quite real and that our understanding of the matter will rapidly become much more profound. It has already been shown that, in certain plants substances capable of diffusing from a stock into a grafted scion are concerned in controlling whether flowering takes place in the first or second year, that is, with or without subjection to cold and short daylight, and it therefore seems most probable that the whole vernalization question will in time be brought into relation with the discovery of plant hormones already mentioned.

Some Soviet authors have claimed that a single vernalization treatment is sufficient to alter the hereditary constitution of the plants, so that its effects are permanent. Most biologists are likely to doubt the possibility of such a direct action, but it may well be that the Soviet workers have actually discovered a phenomenon of great importance. Since the development of a plant, as we have seen, is profoundly influenced by the early treatment of the seed, a single artificial treatment which causes the plant to mature at an abnormal season may have some effect on future generations owing to the altered conditions under which the seed will be formed. Similarly, another phenomenon on which the Russian scientific workers have laid great stress is the effect of a host plant on

the hereditary constitution of a graft; again, the effect may not be a direct one on the hereditary elements as normally understood, but it may be a real phenomenon based on the transmission of something in the nature of a virus.

This brings us to the subject of plant breeding, one of the fields in which the most spectacular advances are likely in the near future. The breeding of disease resistant varieties, which, for example, trebled the yield of sugar cane in Lousiana between 1926 and 1929, will probably score some new successes but it cannot be considered a new technical advance. On the other hand, the practical employment of hybrid vigour is a development of the last few years in maize growing. At the present time something like twenty-five million acres are sown with hybrid corn in America, and increases in yield average about 20 per cent. Probably there are similar benefits to be obtained in other crops. The John Innes Horticultural Institution, for example, has prepared hybrid tomato seed with very considerably enhanced productivity.

The most important advances, however, are likely to come from two fields which are still being intensively investigated. The first is the study of the wealth of forms available in Nature for our use. Until recently the range of types employed by the plant breeder has been getting progressively narrower as he concentrated on the improvement of ever more specialized varieties. But it has been realized that much may be gained by the introduction of new hereditary material and it has come as something of a shock to discover how rich is the stock of forms available Not only are there very numerous local varieties of cultivated plants, each probably with many defects by modern standards although with one or two points of advantage, but there is also a hitherto unexpected variety of wild forms related to the cultivated species. For example, all the cultivated potatoes of the Old World derive from a single species and probably from a very few individuals. We know now at least thirty species, forming a polyploid series, all of which were thought worthy of cultivation by some tribe in South America and there are also related wild species. They include frost-resistant and short-day forms and varieties resistant to various diseases. It is not too much to hope that we shall fairly soon be able to develop potatoes suitable for the Arctic and for the tropics. The profound results of such a spread of the potato belt do not need to be emphasized.

The second major source of new varieties may be found in the very recent technique of artificially doubling the number of chromosomes in hybrids, thus rendering them fertile and comparatively stable in hereditary constitution. Nearly all our most important crop plants have arisen by a chance occurrence of a similar process in Nature. Now that we have discovered substances the most important of which is the drug colchicine, which allows us to double chromosome numbers with fair regularity it is almost inconceivable that we shall not be able to manufacture completely new types of plants of the greatest importance. It is too early as yet to name any examples with complete confidence, but the hybrids of wheat and rye and of wheat and couch grass may be mentioned as instances of promising beginnings.

An advance of another kind is the recent success in hybridizing yeast. Until recently it was thought that if a single yeast cell was isolated it must give rise to a pure colony. But single yeast cells may be either haploid with one of each kind of chromosome or diploid with two. In the latter case haploid cells will be formed during the growth of the colony and the segregation of different types will occur, so that the final colony is mixed. Winge, in Denmark, has succeeded, by a fine technique of micro-manipulation, in isolating single haploid cells, hybridizing them and finally isolating the segregants from the hybrids. This is the first application of modern breeding methods to some of man's oldest

plant collaborators, his assistants in the manufacture of such staples as bread and beer.

If we turn now to the animal field, many of the methods which seem to promise best among plants do not appear very feasible. Thus there are great technical difficulties in making such a full use of hybrid vigour although some promising results have been obtained with fowls. Again, only the very first steps, in which I have myself shared, have been taken towards doubling the chromosome number in animals, and the difficulties to be surmounted before we can produce fertile hybrids in this way are rather overpowering in prospect.

Perhaps the most important new technique which is just passing from the laboratory into general practice is that of artificial insemination. If the sperm of a selected male is artificially introduced into the female, the greater degree of control over the process makes it possible to employ much smaller quantities than Nature provides and the number of offspring which can be obtained from a single male may therefore be multiplied some hundreds of times. This makes it possible to ensure that only the very best animals are used as fathers and the constitution of poor stock may thus be quite rapidly improved. The method has already been tested out on quite a wide scale and it has been found possible to send the sperm of desirable males for very considerable distances by air. The method has a very great part to play in the immediate post-war world when we are confronted with the problem of restoring the scorched earth of eastern Europe.

A development of the technique of artificial insemination which seems likely in the next ten or twenty years is the artificial determination of sex by the separation of male and female determining sperm. Such a possibility is, of course, a favourite theme of all kinds of charlatanry and psuedo-science. But some recent work particularly in the U. S. S. R., indicates a serious possibility that the problem will be solved by the method of electrophoresis, that is to say the passage of an electric current through a suspension of sperm, causing an accumulation of the female determining sperm at the anode and of male determining at the cathode. There are still many technical details to be worked out, such as the most favourable salt solutions, temperature, etc., but it would be a bold man who denied the possibility of fairly early solution of the problem. The importance of such a method for the dairy and poultry industries would be profound, but its application to human affairs obviously presents aspects of great difficulty.

It would be in the highest degree desirable to bring about a similar increase in the reproductive capacities of the females of domestic animals. This may be too difficult a task but some increase can already be envisaged. The administration of suitable hormone preparations, for example, can bring a female into the breeding condition at a time of year when she would normally not be ready to receive the male. Some success has already been achieved in obtaining in this way two crops of lambs a year instead of one. Again, when a female is ready to breed the number of ova produced, and thus the number of young born is rather restricted in many of our domestic animals, and treatments are being worked out which should make it possible to cause the formation of more ova. This will, in the first instance, enable us to cause a regular production of twins by our beasts. For particular purposes of breeding from exceptionally favourable females it may prove possible, by a technique which has already been used in rabbits, to increase the number of ova many times and to transplant some of them to uteri of other females, which would then act as foster mothers from the very earliest stages of the animal's development.

The control over developmental processes given us by the use of hormones may play a part in several other ways. We are beginning to have some understanding of the role of such substances in lactation. We know there are hormones

which control the initial development of the mammary glands as well as the intensity of their secretion, and again it has proved possible to influence to a significant degree the content of milk in several important constitutents. All these investigations, still essentially laboratory matters, are likely fairly soon to reach the point where we can begin to apply them in practice, when they may open up great possibilities of control over our milk supply, particularly in the difficult winter months.

A somewhat more speculative possibility is the employment of hormones for the control of size. In some animals at least, for example, the rat, it has been possible to obtain considerably increased growth by suitable hormone injections. Further, the embryo of a mammal is in a somewhat similar position as regards its mother as the plant grafts mentioned earlier; an effect exerted primarily on the mother may, by influencing the early development of the foetus, produce an alteration which will affect the development of the next generation of young and thus be transmitted potentially for ever. That such an influence of the mother on her offspring of the first generation is a possibility is known from crosses between large and small breeds of horse, in which the size of the mother has a great effect on the size of the foal. An effect in more remote generations has been suggested by some workers using extracts of the thymus gland on rats. The matter is still very uncertain, but if it can be put on a firm basis very important results might be obtained. A further and still more speculative possibility may perhaps be worth mentioning; it has been claimed that the very early administration of growth-promoting extracts has a differential effect on those organs which develop most rapidly at early stages, particularly the brain. It is not clear whether the swollen-headed rats so produced were any cleverer than usual, but the possibility of such an effect may be worth considering, if only as a day-dream to solace the despair to which most educators are from time to time reduced. Let us hope, however, that man is already intelligent enough to use, for his benefit and not only for his destruction, the gifts which science offers, without waiting for a hormonally induced enlargement of his brain. (*Nature No. 3800, August 29, 1942.*)

What's doing in All India – Madras

BY C. VIJAYARAGHAVAN,

Millet Specialist, Agricultural Research Institute, Coimbatore

Madras is conducting a vigorous campaign to increase the production of food crops. To stimulate production, the Government granted a number of concessions to the cultivators and the Agricultural Department is doing intensive propaganda for growing crops by improved methods. In addition to meeting the farmers personally, agricultural officers arranged nearly 3,000 exhibitions and meetings. Propaganda is directed mainly towards (i) bringing new areas under food crops, (ii) adopting intensive methods of cultivation, and (iii) reducing the acreage under commercial crops and using the areas so saved for the growing of food.

Increasing area under food crops In Tanjore, the premier rice growing district, the Government provided irrigation water from rivers and channels by about three weeks earlier to enable the cultivator to begin paddy cultivation early and take two crops of paddy from single crop paddy land. The Government also removed the minimum of Rs. 5 charged as water rate for the second crop land and levied only half the single crop assessment. Landowners, taking advantage of these concessions, put 20,000 acres of the single crop area in Tanjore district under double cropping. In addition to this, the early supply of water

enabled, a large area so far considered as dry to be brought under single crop paddy cultivation. Similar attempts have been made in other rice growing areas to increase the number of crops and to bring the suitably situated dry areas to wet cultivation.

The Government permitted the growing of food crops free of assessment on assessed Government land, unassessed land or disafforested areas in which crops had not been grown in Faslis 1349 and 1350. In the Tanjore and Trichinopoly districts permission was given for food crops on certain land unoccupied for 18 months. Permission was granted for the cultivation of tank beds free of charge provided the crops are removed before the tank is required for storing water. In the allocation of land preference is given to the deserving poor not already owning land. Arrangements have also been made to lease out railway land for cultivation. Permission for the revenue free cultivation of land around schools, churches etc. has been granted. The Agricultural Department made every effort to see that these concessions are fully availed of by the cultivators. Dry food crops like sorghum, *cumbu* (*Pennisetum typhoides*), and *tenai* (*Setaria italica*) are suitable for most of these areas and improved seeds are distributed. Steps were taken to see that all Government office compounds are sown with food grains or vegetable seed. Advice was given in some cases to utilize the space between fruit trees in orchards for food crops. For example in Malabar and South Kanara dry paddy has been advocated in fruit gardens and coconut plantations are being interplanted with tapioca, sweet potato, yams and other vegetables.

Intensive methods of cultivation To increase the yields, rice growers were induced to use improved seed, reduce the seed rate, adopt economic transplanting of seedlings and apply manure liberally. For the multiplication of pure paddy seed on an extensive scale the Government sanctioned four schemes, one in the Cauvery delta, one in the Godavari delta, one in the Kistna delta, and another in the South Arcot district. In most places seed farms have been started by the Department for the supply of improved seed. Agricultural improvement co-operative societies are helping in the production and distribution of pure seed. Vigorous propaganda for reducing seed rate resulted in the saving of paddy seed and production of healthy plants. In the Tanjore district the cent nurseries in which 2½ lb. of paddy seed is sown in a cent of nursery have become very popular.

The Agricultural Department has done intensive propaganda for the increased use of green manures. One of the difficulties in growing green manures have been the lack of sufficient quantities of seed. Growing of green manure for seed in orchards, palmyra groves and on field edges is advocated. Villagers are requested to gather seed and sell it to the Agricultural Department. Large quantities have been bought from available areas and distributed all over the province. In Tanjore, attempts were made to induce village children to gather green manure seed and earn small sums of money. The Department has a number of approved green manure plants—*dhaincha* (*Sesbania aculeata* Pers.), *kolinji* (*Tephrosia purpurea* Pers.), *pillipesara* (*Phaseolus trilobus* Ait.) *sunn hemp* (*Crotalaria juncea* L.), and indigo (*Indigofera Anil* L.). In addition to these, the Department distributed seeds and advocated the planting of several leaf-yielding trees on porombokes, canal bunds, etc.

Groundnut cake is another manure extensively advocated. Efforts are being made to buy cake and distribute it to farmers at reasonable prices. The government sanctioned a considerable sum of money for this purpose.

Loans for seed and manure The Government empowered District Agricultural Officers to grant loans up to Rs. 25 to deserving cultivators for buying seed and manure. A large number of them sought the help of Agricultural Officers

to secure this concession. In the Kistna district, the District Agricultural Officer granted in July 1924 nearly 1,500 loans amounting to Rs. 40,000.

The Government allowed the cultivation of the backyards of houses free of assessment provided vegetables or food grains are grown and the Agricultural Department made every effort to induce householders to utilize their backyards. Large quantities of vegetable seeds were distributed. All the Government farms were growing vegetables to multiply seed for distribution among cultivators. Seeds of several varieties of improved vegetables were made available. The Millet Breeding Station, Coimbatore, distributed in June 1942 over 100 lb. of improved vegetable seeds, including seeds of three leguminous vegetables that are capable of being grown under rainfed conditions.

Efforts were made to convince the farmers of the desirability of growing food crops in preference to non-food crops. The area under cotton, groundnut, etc. was decreased and cereals were sown. In places where the commercial crop is sown as a mixture with a cereal like the Italian millet, larger proportions of the cereals were advocated.

A factory designed for the manufacture of 36,000 lb. of malt food per annum from sorghum grain has started production at Coimbatore. The process for making malt food from sorghum and other locally available cereals was developed at the laboratory of the Government Agricultural Chemist after several years of research. Tests in the laboratory have shown that sorghum malt food is as high in value as other popular malt foods. Clinical tests carried out in 27 Government and private hospitals have proved that this product is suitable for all classes of hospital cases and is specially indicated in cases of gastro-intestinal disorders.

A technique for the manufacture of malt extract has also been perfected. This product is a viscid, light coloured liquid capable of being blended with shark liver oil to give a vitamin-rich concentrate. Arrangements for its commercial production are nearing completion.

Campaign against soil erosion Soil erosion is a problem nearly all over the province. As a preventive, bunding has been widely advocated. The Research Engineer's 'bund former,' a simple but efficient implement designed in the workshop of the Agricultural College, Coimbatore, has been found very satisfactory for this purpose. Levelling, terracing and the planting of trees are other methods suggested. Contour planting of potatoes on the Nilgiri hills has been found to check erosion.

Spacing experiments with paddy showed that close planting of seedling 4 in. and 6 in. apart as against wide planting 12 in. apart contributed to increase of the yield of grain and straw. The exact closeness 4 in. or 6 in. was indicated by the duration of the varieties. The work on pre-sowing treatment of seed paddy by alternately germinating and drying periodically to induce resistance to drought is in progress. It was found that up to a limit germinated seeds when sun dried and resoaked germinated normally.

Burying of coconut husks and leaves in trenches has improved the condition of coconut palms in the red loamy soils of Kasaragod, South Kanara. Apart from the increase in the number of functioning leaves, the palms showed significant increase in the production of female flowers and in the setting percentage resulting in higher yields. This treatment, however, was not as beneficial as a general dose of manure supplying nitrogen, potash and phosphoric acid. From the coconut nursery experiments it was found that the position of the nuts in the seedbed has no relation to the total germination, and that nuts having little or no water in them are not fit for seed purposes.

Studies of the broom-rape of tobacco are in progress. So far mechanical methods of control have proved more economical than chemical methods. The

transmissible nature of cotton sterility (small leaf disease) has for the first time been established. Cultures of ergot of rye are being grown on the Nilgiris for producing this valuable drug. Infusions of *Acorus* rhizomes, *Tephrosia* seeds and pyrethrum flowers are found to be efficient against aphids in a concentration of 1 oz. per gallon of water. Studies are in progress on the control of the sugar-cane borer by the mass breeding of its egg parasite, *Trichogramma minutum*.

Powerful indigenous insecticide Investigations carried out by the Government Entomologist to determine whether the insecticides that are now difficult to obtain could effectively be substituted by any of the locally available plant poisons have resulted in the discovery of a powerful contact insecticide in the kernels of *Thevetia neriifolia*. A native of South America and the West Indies, this plant has been grown in India for many years. It comes up well in South India and is commonly grown as a hedge plant. Aqueous extracts of its kernel prepared by mashing or grinding and then steeping in cold water for 24 hours have been found to be highly toxic against a wide range of insects. Optimum strengths for soft and hard bodied insects have been studied. A strength of ¼ oz of the kernel in one gallon of water is enough to kill plant lice, thrips and leaf hoppers. Half an ounce in one gallon of water is required against the defoliating caterpillars like the moringa hairy caterpillar and the castor semi-looper, while one ounce of the kernel in one gallon of water is necessary for the control of mealy bugs and scale insects. To obtain maximum effect, the addition of soap equal in quantity to that of the kernel used is necessary. Plants sprayed by aqueous extracts of the kernel have been found to be immune from insect attack for short periods. No injury is done to the foliage when the concentration is less than one ounce per gallon. In addition to the kernel, the cake and oil of *Thevetia neriifolia* have been observed to possess toxicity of varying degrees. *Thevetia* oil has been found to act as a deterrent against termite attack. (*Indian Farming Vol. 3, No 12, December 1942.*)

Gleanings

Chemical elements needed for plants Healthy plants, like good steel, need the addition of minute amounts of a number of chemical elements. Some of them are the same as those required for modern steel making, including manganese, molybdenum and copper. The story of these "micro-nutrients" was the subject of the address of Professor D. R. Hoagland, of the University of California, president of the Pacific Division, American Association for the Advancement of Science.

The need of plants for these minute traces of certain elements was completely unknown until a few years ago and even now it is not certain that the list of micro-nutrients is complete. Of most of them, only a few parts in a million of soil solution are needed to maintain plant health, yet without them the plant sickens and perhaps dies.

Lack of some of these elements produces plant diseases that might formerly have been ascribed to the attack of sub-microscopic viruses. Fruit trees in soils without zinc, for example, produce symptoms known as 'little leaf' and 'mottle leaf'. Most soils have sufficient quantities of the micro-nutrient elements for all practical purposes but where they are lacking it is important to detect which ones are short and to remedy the defect.

Bearing on this subject also are relations between the nutrition of plants and that of the human beings and animals that eat them. Some of the micro-elements in plants are of as great physiological importance indirectly to animal life as they are directly to the life of plants. This field of research is only beginning to be explored. (*Science, June 26, 1942.*)

Hormone sprays for fruit The recent rapid developments in the investigation of growth-promoting substances have been closely followed by widespread attempts to apply the so-called plant hormones in horticultural practice. The use of synthetic growth substances to facilitate the rooting of cuttings became a craze almost overnight and there is no doubt that remarkable results were achieved in many cases. There are still, however, species which resist all attempts to make them produce roots readily enough to make this method of propagation practicable on a commercial scale.

Other uses for growth substances have now become the centre of interest, and these form the subject of a review in the *American Fruit Grower* of June 1941. Perhaps the most successful application has been the use of naphthalene acetic acid and naphthalene acetamide to control the pre-harvest drop of apples. Spraying with dilute solutions of these substances by delaying the formation of the abscission layer, enables fruits to be kept on the tree until a desirable degree of colour and maturity is reached. Fruit dropping from pears, plums, apricots, oranges and cherries has also been reduced, and, in the case of the latter, the sprayed fruits showed a lower acid and higher sugar content than the controls. Satisfactory results with some English varieties of apple have been obtained by similar methods at the East Malling and Long Ashton Research Stations. The method appears to be of particular value in combating the effects of strong winds. Also of interest is the checking of bud development by hormone sprays. By this means the risk of frost injury to fruit blossoms in spring may be reduced. Indole butyric acid, applied unilaterally to growing shoots of young apple trees, causes more rapid growth on the treated side. By this means the development of narrow-angled and therefore structurally weak crotches can be avoided. (*Nature, July 4, 1942*).

New uses for cotton If the cotton industry is to hold its position in the future as a major industry, scientific research must be intensive in several major fields. There is need for three lines of research on lint cotton ; (1) on the chemical and physical properties of the individual fibres ; (2) on the mechanical processing of cotton and its manufacture into various products, and (3) on chemical finishes for cotton products. Most cotton products in use today were developed through trial and error.

New and improved cotton products developed as a result of research work by various organizations in many fields include an inexpensive cement shingle using cotton fabric as a reinforcing membrane, a method of making cotton pile fabrics for automobile and furniture seats, a process by which cotton webbing and resins are used to form felts for industrial use, a way of making disposable towels, wrinkle-resistant finishes, flame-proofing and water-proofing treatments to increase serviceability of cotton products.

The Southern Regional Research Laboratory has contributed directly to the war effort in its cotton research in the development of means for cutting cotton to uniformly short lengths so that it can be used with existing commerical eqnipment to supplement linters for making smokelss powder, and in providing a list ofeffective treatments for protecting sandbag fabrics from attack by soil micro-organisms.

Other laboratory cotton research objectives of importance are: plastic coated or impregnated fabrics for replacing rubberized fabrics ; an unlined cotton fire hose to replace linen hose of the same type ; improved mesh fabrics for use as a base for nonshatterable transparent plastic substitutes for window glass ; and the development of cotton products to replace those made from certain imported fibres which are difficult or impossible to obtain.

Research efforts on products of cottonseed include development of adhesives for plywood, paper-coating material to supplement casein, synthetic wool-like

fibres, modified cottonseed oil to replace olive oil in the textile industry and palm oil in the tin plate industry and to replace certain imported waxes. *D. F. J. Lynch, Director, Southern Regional Cotton Laboratory. (Agricultural Situation, August 1942.)*

Research Items

Brachiaria distachya Stapf and _B. miliformis_ Chase—two species or one?

Brachiaria distachya Stapf (Telugu-*Koranna gaddi*; Kanarese-*Hambu haraka-hullu*) is one of the commonest pasture grasses of the Madras Province and is met with in almost all the districts. It resembles Hariali grass (*Cynadon Dactylon* Pers.) in the growth habit and gives the characteristic matting surface to the soil. C. E. C. Fischer in the Flora of the Madras Presidency splits this into two species viz., *Brachiaria distachya* Stapf and *B miliformis* Chase, with the remark that they are very similar to one another and are often confused. The two specimens in the Herbarium which were collected from the west coast viz., Kuttuparamba in Malabar and Kudlu near Kasaragod in South Kanara district and stamped at Kew, England as *B. miliformis* Chase show differences from *B distachya* Stapf only in the comparatively glabrous nature and larger size of the plant and leaves. By a critical study of these two species the writer has come to the conclusion that both these species are one i. e., *B. distachya* Stapf and the variations as regards the puberullus or the glabrous nature of the peduncle and the larger size of the plant and leaves on which the classification was based are as usual with many other plants due to climatic and soil conditions.

The Herbarium,
Agri Res. Institute, Coimbatore,
24th March 1943.

K. Cherian Jacob.

Freaks in Arecanut

Tillering is a rare phenomenon in areca palm (*Areca catechu*, L). At the Agricultural Research Station, Taliparamba, a number of arecanut seedlings were planted in 1936, along the wetland bund. Three years after planting, one of the plants developed two more shoots at its base, which have by now grown into good sized trees, and nearly as big as the originally planted one. Although some of the others planted along with this are on flower none of these three have begun to produce flower. In 1940, three more sprouts originated, one by the side of each of the existing tillers, making a colony of six individuals where only a single seedling was originally planted.

In the arecanut inflorescence, the female flowers which develop into nuts are normally located towards the base of the spikes. But in one instance a ripe nut developed at the extreme end of one of the spikes. The nut was normal except that it was smaller in size than an average nut of the bunch.

Agricultural Research Station,
Taliparamba, 24th Feb 1943.

P. Narayanan Nayar.

Hints for Bee-keepers

For May

The main source of pollen during the month is *Chitrai* (irrigated) *cholam* and that of nectar tamarind. Appreciable quantities of honey are available for extraction in localities where these two exist; otherwise the condition of the colonies is generally unsatisfactory. Other sources of pollen pasturage are avenue trees such as *Poinciana regia*, stray trees of *Peltophorum* etc. Scanty supplies of nectar may be available from straggling flowers of cotton. A steady dwindling of the population of the colonies may occur in unfavourable localities.

The supers and superfluous combs of such colonies should be removed and stored carefully.

As the month happens to be the fag end of the honey season, a review of the common bee pasturage plants may not be out of place. They are enumerated below in the order of importance. Among the pollen yielders the more important are maize, *cholam*, *cumbu*, palmyra, avenue trees such as *Peltophorum*, *Holoptelia integrifolia*, *Ailanthus excelsa* and *Korukkapalle*, castor, vegetables such as gourds and onions, ornamental plants like *zinnia*, sun-flower and *cosmos*, and even such weeds as, *Lagasca mollis* and *Tridax procumbens*. Cotton, tamarind, margosa, coriander, wood-apple, *pungam*, rain-tree, white babool, *Albizzia Lebbeck*, drumstick and ornamental plants like sunflower, balsam, fiddlestick (*Citherexylon subserratum*), *Antigonon* etc constitute the common sources of nectar. The list is by no means complete, and a more comprehensive account is given in the Departmental Bulletin No. 37 with the approximate months of flowering of the different plants. The varied and luxuriant flora of our jungle areas, hilly and sub-montane regions also offer splendid scope for bee-keeping.

Bees exhibit remarkable powers of discrimination in selecting their sources of food material. The criterion for the selection appears to be the quantity of food available per trip, especially in the case of pollen. The graminaceous plants mentioned in the previous paragraph contain a large quantity of the powdery material within a compact flower-head and bees prefer these to more imposing sources like *Peltophorum*, *Poinciana regia*, etc. which, though more showy contain much less pollen. The time of visit by bees to the different crops is equally interesting. Cotton and tamarind are visited practically throughout the day, if the weather is mild. Nectar is collected from margosa flowers by day break and from *daincha* during the afternoons. Bulk of the pollen collection is made in the mornings only. M. C. Cherian and S. Ramachandran.

Crop and Trade Reports.

Cotton Raw in the Madras Presidency The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February to 2nd April 1943 amounted to 56,953 bales of 400 lb. lint as against an estimate of 393,900 bales of the total crop of 1942–43. The receipts in the corresponding period of the previous year were 72,631 bales. 97,865 bales mainly of pressed cotton were received at spinning mills and 639 bales were exported by sea while 42,286 bales were imported by sea mainly from Karachi and Bombay *Director of Agriculture.*

Moffussil News and Notes

Agricultural Exhibition in Anantapur and Cuddapah districts Four Agricultural Exhibitions on a small scale were held in Alladapalle, Proddatur Taluk, Athirala, Rajampet Taluk, Ananthapuram of Royachoti Taluk and Banukota in Pulivendla Taluk of Cuddapah District. Practical ploughing demonstrations were conducted and green manure crops and specimen crops of various improved strains were exhibited. B. S. M.

Good farmers and Green manure week, East Godavari The prize distribution function for "good farmers" and for service rendered in grow more food campaign and the inauguration of the "green manure week" in the East Godavari District was held at the Agricultural Research Station, Samalkot on the 7th April 1943. Sri Rao Sahib M. A. Kuttalalingam Pillai, B. A., District Collector, East Godavary, presided and distributed the prizes. Prizes were awarded to pioneers in agricultural progress for well run holdings. Certificates were also presented to individuals who have spread improved agricultural methods. A

sum of Rs. 550 from the discretionary grant was utilised in granting the following prizes viz., 20 wooden grinders, 30 bee-hives, 8 honey extractors, 32 quarter bags of improved paddy seed and 2534 vegetable seed packets. Dr. S. Rangaswamy, L. M. S. & D. T. M. spoke on the advantages of wooden grinder rice. The District Agricultural Officer, Sri S. Sitarama Patrudu spoke on the progress of Research, the importance of green manure and the extent of work done in connection with increased food production. An attractive show particularly of green manure seeds and crops was arranged. The meeting was attended by a large number of *ryots* from the various parts of the district.

Agricultural Exhibition, Karavalur [Avanashi Taluk An Agricultural Exhibition on a fairly large scale was held at Karavalur from the 23rd to 27th March 1943 during the local Mariamman festival when a large number of *ryots* of this taluk and of adjoining taluks attended. A special feature of the exhibition was the impetus given to the "Grow More Food" campaign by offering prizes to those who gave preference to food crops in their cultivation programme. P. S. A.

Agricultural Exhibition at Perdur, Udipi Taluk Under the auspices of the Agricultural Association, Perdur, an agricultural exhibition was conducted by the Agricultural Demonstrator, Udipi, on the occasion of the annual car festival of Perdur temple, when over 10 000 pilgrims congregate from all parts of the district and the State of Mysore. The Exhibition was subsidised by the discretionary grant of Rs. 20 from the Collector of S. Kanara, which amount was utilised for the award of prizes to *ryots* of Perdur centre who had adopted the improved methods of agriculture and to those persons who had exhibited agricultural produce of outstanding merit. The Exhibition was held from 13-3-43 to 17-3-43. K. S. S.

Exhibition at Puthiyara-Calicut An exhibition was held in a prominent place in the most crowded area on the main road near the Trichambaram temple (Taliparamba) on the 15th and 16th March 1943. Exhibits covering all aspects of agricultural improvements and food production were on show. At a modest estimate not less than 10,000 people visited the exhibition during the two days. A. G. N.

Exhibitions and shows--Tellicherry An Agricultural Exhibition was organised by the Agricultural Association, Tiruvangad, with a subsidy of Rs. 50 from the Collector of Malabar for awarding prizes to the best exhibits of food products, livestock and products of cottage industry A number of exhibits were put up by the local people. The exhibition was opened by the Revenue Divisional Officer, Tellicherry, on 17—2—'43 and it remained open to the Public till midnight on 24—2—'43. More than a lakh and half of people from all over Malabar who attended the Jagannath temple festival, visited also the exhibition stall. A. G. N.

Agricultural Exhibition at Tiruvarur A fairly large scale Agricultural exhibition was staged at Tiruvarur during the Rudrapatham Festival for a week from 15th to 21st of March 1943. The exhibition, was opened by the Sub Collector, Negapatam, on the 15th. Besides the Departmental exhibits private exhibitors also participated in the show, It is estimated that about 10,000 people visited the stalls during the week the exhibition was on. M. A.

Paddy strain—Adt 19 Sri G. Venkatachalapathi, Secretary, Grow more food committee and Member, Agricultural Association, Peruvalanallur, writes: I am pleased to bring to your notice that I grew Adt. 19 paddy strain in my village during the *Kar* season of 1942—43 in an area of one acre and got an increased yield of 25% over the local *sarapali*. This strain is so popular and the demand for the seed is now so great that I have distributed about 16 bags in my village. I am sure that within 2 or 3 years the whole village of Peruvalanallur will begin to grow this strain only.

Estate News and Notes

The College The College was closed for the mid summer vacation on the 1st April and on the same date the University examination for the B. Sc. Ag. degree commenced.

Back to Madras The offices of the Director of Agriculture and Provincial Marketing Officer which were located on the Estate have been shifted back to Madras, with effect from 26th April '43.

Our Graduates We offer our congratulations to the following students who have been awarded the Diploma of the Imperial Agricultural Research Institute, New Delhi (Assoc. I. A. R. I) Messrs. P. Thothadri (Agricultural Chemistry), Anantarama Panda and A. Seshachalapati Rao (Entomology).

Imperial Dairy Research Institute We are glad to learn that the Imperial Dairy Research Institute, Bangalore, has been authorised by the Government of India to entertain Honorary Research Workers, who are graduates of Indian and European Universities and who are desirous of carrying out research work at the Institute. Such candidates as are suitable and well qualified for dealing with a problem within the purview of the work and activities of the Institute will be selected The number of workers to be admitted will be limited to two at present and their period of research work will not ordinarily exceed one year. The workers will be exempt from payment of any fees for the period of the research work; but they will have to make their own arrangements for board and lodging.

Departmental Notifications

Gazetted Service—Postings & Transfers

On relief by P. H. Rama Reddi, Esq, Director of Agriculture, Sri P. Venkataramayya is reposted as Principal and Government Agricultural Chemist, Coimbatore.

Sri H Shiva Rao, officiating Government Agricultural Chemist, on relief by Sri P. Venkataramayya, is reposted as Assistant Agricultural Chemist.

Sri C. R. Srinivasa Ayyangar, temporary Principal on relief by Sri P. Venkataramayya to continue as Paddy Specialist, Coimbatore.

On return from leave Sri S. Jobitha Raj D. A. O to be D. A. O. Tanjore.

Sri R. Chokkalingam Pillai, D. A. O. Madura to officiate as Cotton Specialist, Coimbatore.

Sri C. M. John, Oil Seeds Specialist to be Oil Seeds Specialist and Geneticist vice V. Ramanatha Iyer granted leave.

Sri N. Subramania Ayyar, D. A. O. Sattur to be D. A. O Madura.

On return from leave Sri A. Ramaswamy Ayyar to be Asst. Marketing Officer, Madras.

Sri T. S. Ramakrishna Aiyar, Assistant in Mycology, II Grade is appointed to act as Assistant Mycologist, A. R. S. Nanjanad.

Leave

Sri K. Raghava Acharya, D. A. O. Cuddalore, l. a p. for 2 months and 11 days from 3—5—43 preparatory to retirement.

Sri M. Anandan, D. A. O. Tanjore, l. a. p. for 2½ months from 10—4—43.

Sri Rao Bahadur V. Ramanatha Ayyar, Cotton Specialist and Geneticist, Coimbatore, l. a. p. for 3 months from the date of relief.

Sri P. N. Krishna Ayyar, Asst. Entomologist, Coimbatore, extension of l. a. p. for 1 month from 24—3—43.

Subordinate Service—Appointments

S. M. Muhammad Sulaiman Sahib, is appointed as Upper Subordinate, Agricultural Section and is posted to Tirchengode as Junior Agricultural Demonstrator for Cotton Seed Multiplication Scheme.

Promotions

Sri N Narayana Ayyar, Asst. A. D. V Grade to IV Grade with effect from 14—3—43.

The following four fieldmen have been selected for promotion as officiating Upper subordinates in the Madras Agricultural Subordinate Service to take effect from 1—4—43.

Sri G. V. Brahmayya. fieldman. D. F. S. Hagari, to be F. M. D. F. S. Hagari.

Sri C. Venkata Naidu, fieldman A. R. S. Siruguppa, to be Asst. in Chemistry A. R. S. Siruguppa.

Sri M. K. Lingiah, fieldman A. R. S. Aduturai, to be F. M. A. R. S. Aduturai.

Sri M. Mukundan, fieldman A. R. S. Pattambi, to be Asst. in Paddy, Pattambi.

Transfers

Name of officer	From	To
Sri A. Chidambaram Pillai,	(On leave)	A. D. Conjeevaram.
.. T. K. Mukundan,	F. M. Central Farm, Coimbatore,	A. D. Rasipuram.
,, S. Suryanarayana,	A. D. Kirlampudi,	A. D. Vizagapatam.
,, M. Satyanarayana,	F. M. A. R. S. Samalkota,	F. M, A. R. S. Guntur.
,, Ambikacharan,	A. D. Kanigiri,	A. D. Nandyal.
Janab K. Fazlullah Khan Sahib	A. D. undergoing training at Palladam,	Temporary Asst. in Fruits, Coimbatore.
Sri Ch. Venkatachalam,	A. D. Kovvur,	A. D. Tadepalligudem.
,, S. Lakshminarayana Pantulu,	A. D. Pattikonda,	A. D. Kovvur.
,, P. N. Muthuswami,	A. D. (Sugar Excise Fund) Podanur,	A. D. Udumalpet.
,, V. K. Kunhunni Nambiar.	A. D. Udumalpet,	A. D, Cheyyar.
,, G Kameswara Rao,	A. D. Tadepalligudam,	A. D Kurnool.

Leave

Name of officer	Period of leave
Sri S. Krishnamurthi, Asst. College Orchards, Coimbatore,	L. a. p. for 31 days from 31—3—43.
,, N. Krishna Menon, Asst in Entomology, Coimbatore,	L. a. p. for 4 months from 5—5—43.
,, M. P. Gourisankara Iyer, A. D. Devakottai,	L. a. p. for 3 months from the date of relief.
,, T. Ramanujulu Naidu, A. D. Venkatapuram,	Earned leave on full pay for 35 days from the date of relief.
,, K. Govindan Nambiar, A. D. Palghat,	L. a. p. for 3 months from 5—4—43.
,, A. Chidambaram Pillai, Secretary, South Arcot Market Committee, Cuddalore,	L. a. p. for 5 weeks from 1—4—43.
,, K. V. Natesa Iyer. Supdt. Groundnut Market, Tindivanam,	L. a. p. for 1 month from 1—4—43.

Sri M. Subba Reddi. A, D. Venkatagiri,	L. a. p. on m. c. for 2 months from 18—3—43.
„ T. V. Srinivasacharlu. A. D. Sriperambudur,	L. a. p. for 2 months from 15—4—43.
„ C. Raghavendrachar. Asst. in Chemistry, Coimbatore,	L. a. p. for 2 months from 5—4—43.
„ K. Sitarama Aiyar, A. D. Attur,	L. a. p for 3 months from 7—4—43.
„ C. S. Sankaranarayana Ayyar, A. D. Pelur,	L. a. p. for 2 months from 7—4—43.
„ M. B. Venkatanarasinga Rao. Asst in Paddy, (Temporary Technical Asst. under the I. C. A. R.)	L. a. p for 2 months and 15 days from 1—4—43.
„ M. M. Krishna Marar, Asst. in the Groundnut Scheme, Coimbatore,	Earned leave for 50 days from 12—4—43.
„ B. L. Narasimhamurthi. Asst. in Millets, Anakapalle,	L. a. p. for 20 days and half average pay for 40 days from 9—3—43.
„ S. Bhima Raju, A. D. Chandragiri,	L. a. p. for 4 months from 18—4—43.
„ D. Bapaiah, F. M. A. R. S., Guntur.	L. a. p for 3 months on m. c. from 11-3—43.
„ Bhagirathy Padhy, A. D. Palaconda,	L. a. p. on m. c. for 1 month from the date of relief.
„ S. Ramaswami Raju, Sub Asst in Botany, Coimbatore,	L. a. p. for 1 month from 26—4—43.
„ S. V. Parthasarathy, Asst. in Botany, Coimbatore,	Earned leave for 36 days from 26—4—43.

The Madras Agricultural Journal

(ORGAN OF THE M. A. S. UNION)

Vol. XXXI MAY 1943 No. 5.

EDITORIAL

Production of Insecticides and Fungicides The use of insecticides and fungicides for controlling pests and diseases of crops was never popular in India owing partly to the high cost of the many imported chemicals which constituted them and partly to the general indifference of the average cultivator. The reason for the latter is not far to seek. Though the damage caused by insects and fungus diseases to field crops and stored produce was indeed very great and the resultant loss colossal when the country was considered as a whole, the individual cultivator with his small holding seldom realized the extent of the loss or suffered to such an extent as to induce him to invest money on chemicals and appliances. Nor was he convinced that their use would result in the effective control of the pests or diseases. Consequently, the use of insecticides and fungicides was confined to coffee and tea plantations, orchards, etc., where they were found to be beneficial and profitable.

The recent nation-wide drive for enhanced food production and the rising prices of agricultural commodities have not only brought more land under the plough but have also resulted in more intensive farming of existing cultivable land without due regard to season or proper rotation or diversification of crops— factors, which in normal time were responsible to a great extent to keep in check the multiplication of pests and diseases. Moreover, the need for conserving food grains in store houses for considerable period free from damage by pests has also become a war-time necessity. The import of adequate quantities of chemicals from foreign countries being now out of the question, the problem of exploring and augmenting the resources of the country with regard to insecticides and fungicides has become important and deserves the attention of the Scientific Departments, cultivators and manufacturers alike. Sustained and co-ordinated efforts are therefore to be made to place at the disposal of the cultivator, cheap and effective substitutes, if the goal of increased production of food crops aimed at by the inauguration of the Grow More Food Campaign is to be achieved. We are glad to note that the Imperial Council of Agricultural Research and the Government of Madras have taken on hand measures to

investigate the possibility of substituting the imported chemicals with material and plant products available in India. The Government of Madras have already arranged to bring under cultivation large areas of Pyrethrum in the hills and to multiply planting material of Derris which are well known plants yielding powerful insecticidal products. There are also several local plants such as tobacco, *Thevetia, Tephrosia, Acorus,* etc., which yield substances possessing high insecticidal properties and a co-ordinated research programme on the botanical, chemical and biological aspects is of immediate necessity. We commend this to the earnest consideration of all Provincial and State Departments of Agriculture in India, so that the menace from pests and diseases may be readily controlled before they attain serious magnitude and prove a mill stone against the Food Production Drive.

Improvement of Pulses in Madras A scheme for the improvement of pulse crops in the Madras Presidency has been sanctioned by the Government with the aid of a part contribution from the Imperial Council of Agricultural Research, and a Pulses Specialist has been appointed. The need for investigation of this important group of crops with a view to increase their production has been felt for long, especially, as pulses form the chief source of protein in the South Indian diet and also an important cattle feed. The scheme of work as at present drawn up is only for a period of five years, but we hope that the work will expand and that the Pulses Section will be a permanent one like the other crop breeding sections of the Agricultural Department, so that all aspects of the cultivation of pulses may be investigated thoroughly.

Indigenous Dyes of the Madras Province

By K. CHERIAN JACOB, L. Ag., F. L. S.,
Agricultural Research Institute, Coimbatore.

Dyeing is a very ancient industry and it is known that barbarians in remote ages painted their bodies with gay colours. It is difficult to decide as to which of the three countries, India, China and Egypt, was the first to learn the uses of vegetable dyes. Though India is one of the countries to originate the art, we have not gone far in improving it on scientific lines. The Westerners learnt the art from the East and step by step improved it to a fine degree in which their knowledge of chemistry was very helpful. With the first World War, aniline dyes, which are products of distillation of coal tar, replaced the vegetable dyes to a large extent. The advent of the Second World War has made the import of these dyes into India very difficult. The plight of handloom weavers of this Province is very hard and very high prices are demanded for the artificial dyes. This is an opportune time to study and develop this industry not only by a study of the chemical processes and skilful combinations of colours but also by a search for new plants that may yield dyes. Most of the important indigenous dyes of this Province, with the local names and short descriptions of the plants from which they are extracted, mordants and uses of the dyes are given below. It is hoped that it will be of assistance to those who are interested in this ancient industry which is full of scope for development.

1. Red and shades of red

1. *Catechu* The dye is extracted from *Acacia Catechu* Willd. (Tam: *Kasikatti maram;* Tel: *Nalla sendra)* which is a moderate-sized deciduous tree with pale yellow flowers. It occurs in the deciduous forests of most of the districts in this Province especially in the Northern Circars. The chips of heart-wood of mature trees boiled with certain mordants yield a dull red dye. Mordants generally used are lime, alum, perchloride of tin and copper nitrate. This dye is much used by the calico printers of India.

2. *Sappan* This dye is extracted from *Caesalpinia Sappan* Linn. (Tam: *Varattangi:* Tel: *Bakanu Patanga)* which is a small thorny tree found under cultivation in some gardens in Madras, Courtalam, Coimbatore and other places. The wood yields a valuable red dye which is largely exported. The root is reported to yield a yellow dye. It is largely used with alum in calico-printing and in Madras for dyeing straw-plait for hat-making. In Pegu it is used for dyeing silk.

3. *Carthamine* is extracted from the flowers of *Carthamus tinctorius* L. (Eng: The safflower, wild or bastard saffron, African or American saffron; Tam: *Kushumba;* Tel: *Kusumba)* which is an annual herbaceous plant with large orange coloured flower heads, cultivated as dye-crop all over India and as an oil-seed in the Madras Province. It is grown extensively in the

black cotton soil areas of this Province and is not found wild anywhere. The florets are picked as fast as they appear and dried in the shade and pressed. The yellow colouring matter is washed off and the red colouring matter is extracted by dissolving in dilute alkaline solutions and is used in dyeing silk and wool.

4. *Gulnari* (Bengal) or *Basanti* (Cawnpore) is extracted from the flowers and seeds of *Cedrela Toona* Roxb. (Tam: *Toona maram*; Tel: *Nandhi chettu)* which is a large handsome tree common in the mountainous tracts of the Province. The flowers yield red and yellow dyes said to be used in Bengal and Mysore for dyeing cotton. The seeds yield a red dye. The colour is fleeting and apparently only used by the poorer classes for dyeing cotton cloth.

5. *Erythrina indica* Lamk. (Eng: Indian Coral-tree; Tam: *Mulu murukk;* Tel: *Badisa;* Mal: *Murukku*) is a striking tree in flower and of moderate size, armed often with prickles. It occurs throughout the Province often planted. The flowers are collected, dried and boiled in water to extract a red dye. The bark is also said to be used in dyeing.

6. *Majiti* (Garhwal) The dye is extracted from the flowers of wild *Impatiens Balsamina* L. (Eng: The Garden Balsam) which is an erect herbaceous annual of one to three feet high. It is found in hilly regions but at low elevations. Flowers yield a red dye. Some people use the juice of this plant mixed with alum to colour their eyes and nails

7. *Henn* or *Henna* is prepared from the leaves of *Lawsonia inermis* L. (Eng: The henna plant; Tam: *Maruthani*; Tel: *Gorinta*; Kan: *Gorantu*) which is a shrub growing to eight feet in height with white flowers and small leaves. It is found in the deciduous forests of the Coromandel Coast and planted sometimes as a hedge plant in other places. Leaves are used in dyeing handkerchiefs in Rajputana and by certain classes of people for colouring beard, nails, etc.

8. *Kamala* is extracted from the red powder which covers the fruits of *Mallotus philippinensis* M. Arg. (Eng: The monkey face tree; Tam: *Kamela*; Tel: *Kunkuma, Kapila*) which is a small much-branched tree common in the deciduous forests throughout the Province. The red powder which covers the fruit yields a rich orange red dye known as *Kamala dye.* The extract prepared with soda imparts to silk a fine and durable flame-colour without further addition or the use of mordants. It is employed in dyeing silk.

9. *A'l dye* is extracted from the roots of *Morinda citrifolia* L. (Eng: The Indian mulberry; Tam: *Nuna*; Tel: *Mogali*; Mal: *Manjanathi*) which is a small tree with white flowers and large fleshy fruits found in the coastal forests of the Northern Circars and the West Coast districts of this Province. Roots of fairly old trees give a red dye. The roots are mixed with a little sweet-oil and ground to powder in a handmill. Cloth is dyed by being boiled with this powder. The cloth is treated with alkaline earth, alum water,

decoction of myrobalan, etc. It is used for dyeing cotton cloth. The dye contained in the root-bark seems to be the best red, whereas that contained in the woody parts of the roots is more yellow than red.

10. *Morinda tinctoria* Roxb. (Tam : *Nuna*; Tel : *Togari, Maddi*) is a moderate-sized tree found in all the dry districts of this Province. The wood and the bark of stem and root yield a red dye apparently identical with that of *M. citrifolia* L.

11. *Chay root* This dye is extracted from the root bark of *Oldenlandia umbellata* L. (Eng : Indian Madder; Tam : *Chaya ver*; Tel : *Chiri veru*) which is a small herbaceous plant with lilac flowers spreading on the ground and growing to six inches in height. It is common throughout this Province especially in waste places. It was in much cultivation for its dye at Nellore and Masulipatam many years ago. The root-bark of this plant, commercially known as chay root, yields the dye. Alum is used as mordant. In olden days handkerchiefs were dyed in Madras with this dye.

12. *Santalin* is extracted from the wood of *Pterocarpus santalinus* L. f. (Eng : Red Sanders-wood; Tam : *Segappu chandanam, Raktha chandanam*; Tel : *Yerra chandanam*) which is a pretty and moderate-sized tree found only in limited areas. It occurs in the hills of Cuddapah, North Arcot and Chingleput districts. The wood contains a red colouring matter called *santalin* which is easily dissolved out by means of any alkaline solution and is used as a dye. This is used for dyeing textile fabrics, as colouring agent in pharmacy, for dyeing leather, for staining wood and also employed in India as a pigment for marking idols and the forehead in some caste ceremonies.

13. *Manjit* is obtained from *Rubia cordifolia* Linn (Eng : The Indian madder; Tam : *Manjithi, Shevelli*; Tel : *Manjishta*) which is a very scabrous climbing herb with ovate-cordate, 5—7 ribbed leaves. It is found in the forest regions throughout the Province. The stem is cut into very small chips which are carefully washed and boiled in water for six hours. The cotton cloth to be dyed for red is boiled for ten minutes in alkaline water made by the addition of some ash and then drenched several times in the dye. Alum is usually employed as a mordant.

14. *Lac-dye* (Tam: *Komburuki*; Tel: *Kommaloka*). Lac is the resinous incrustation formed on the bark of twigs especially of *Schleichera trijuga* Willd. in this Province by the action of the lac insect, *Coccus lacca*. *Schleichera trijuga* Willd. (Tam: *Puvam*; Tel: *Puska*) is a large tree occuring in most of the districts of this Province. Systematic inoculation of lac-insects and collection of lac are done by the Forest Department of this Province. The lac-dye has been in use from remote times not only for textile purposes but also as a pigment in cosmetics.

II Yellow and shades of yellow.

15. *Annatto* is extracted from the seeds of *Bixa orellana* L. (Tam : *Kurangu-manjal*; Tel : *Jaffra chettu*) which is an evergreen shrub or small

tree cultivated and found wild especially in the West Coast districts and the Circars. The dye may be extracted from the seeds direct or from the pulpy matter which may be separated from the seeds by boiling and made into cakes. It is used to give a flesh colour to cotton and silk. It is also used for colouring butter.

16. *Adhatoda Vasica* Nees (Tam: *Adhatodai;* Tel: *Adasara)* is an evergreen shrub, often gregarious, growing to about eight feet in height. It is found in the Northern Circars and elsewhere, cultivated and run wild near villages. The leaves yield an yellow dye on boiling. It gives a greenish blue dye when combined with indigo. The dye is used for dyeing coarse cloth.

17. *Kanthal* is extracted from the wood of *Artocarpus integrifolia* L. (Tam: *Pila*; Tel: *Panasa*) which is a large tree, cultivated throughout India for its monster fruits. The heart wood yields an yellow dye The colour is fixed, with alum and often intensified by a little turmeric. With indigo it gives a green colour. It is used to colour the Burmese priest's robes and also as an ordinary yellow dye in parts of Madras.

18 *The Tesu dye* is extracted from the flowers of *Butea frondosa* Koen. (Tam: *Purasu, Palasham;* Tel: *Palashamu, Motuku*) which is a moderate-sized tree met with in all dry districts in the deciduous forests. It is very conspicuous when in flower before the leaves appear. The flowers called *tesu* or *kesu* yield a brilliant but fleeting yellow dye. They are collected in March and April and sun-dried. The dried petals are separated and preserved or they are sometimes reduced to powder. Alum, lime or wood-ash makes the colour less fleeting. This dye is used for dyeing textiles.

19. The extract of *Kamala* prepared with soda imparts a fine and durable deep orange colour to silk (vide no. 8).

20. *Turmeric dye* is obtained from *Curcuma longa* L. (Eng: Turmeric; Tam: *Manjal*; Tel: *Pasupu*) which is a herbaceous plant with large leaves and root-stock. A type with harder root-stock and much richer in the dye principle than in the ordinary condiment type, is grown wherever it is used as a dye. The main rhizome yields the dye Alum purifies the colour and destroys all shades of red. Carbonate of soda and lime juice are mixed for getting a brilliant yellow. This dye is used in all kinds of textiles.

21. *Garcinia tinctoria* Dunn. *(G. xanthochymus* Hk. f.) (Tam: *Mukki*; Tel: *Iwara mamidi*) is a handsome evergreen tree of moderate size with very hard wood found in the forests of Northern Circars, Western Ghats, Nilgiris, North Travancore, etc. The bark is employed in extracting a bright yellow dye which is used in dyeing cotton.

22. *Mahonia Leschenaultii* Takeda (Eng: Indian barberry) is a large shrub with stiff, erect, corky-barked stems. It occurs in the hills of the

Western Ghats from the Nilgiris southwards, above 5000 ft. in shola forests. A yellow dye is extracted from the wood.

23. The dye contained in the woody parts of the roots of *Morinda citrifolia* L. is yellow (vide no. 9).

24. *Nyctanthes Arbor-tristis* L. (Eng: Night flowering jasmine; Hind: *Harsinghar*; Tam: *Parijatham*; Tel: *Pagada malle*) is a bushy shrub or small tree rough all over with stiff whitish hairs found in the deciduous forests of the Northern Circars; elsewhere it is planted. Flowers yield an yellow dye. It is largely used for dyeing tussur silk. Sometimes in combination with turmeric it is used for dyeing other silks. The white portions of the flowers yield a purple dye known as *Gulkama*.

25. *Terminalia Chebula* Retz. (Eng: Myrobalan or Indian gallnut; Tam: *Kadukkai*; Tel: *Karakka*) is a large deciduous tree found in all districts of the Province all over the forests. The dried fruits form the "Chebulic" or Black Myrobalan of commerce. The powdered rind of the fruits steeped in water is used as dye. A permanent yellow dye may be got with alum. This is used for dyeing cotton cloth.

Grey A mixture of the fruit and ferrous sulphate in certain proportions produces an iron grey colour.

Black The fruit is mixed with the pods of *Caesalpinia Sappan* to produce a black dye.

26. *Ulex europaeus* L. (Eng: Gorse or furze) is a thorny shrub of two to four feet in height. It is an European plant and has become completely naturalised in the Nilgiri and the Pulney hills at high elevations. Bark, flowers and young shoots yield an yellow dye. The dye is used for dyeing textile fabrics.

27. *Allium Cepa* L. (Eng: The Onion; Tam: *Venkayam*; Tel: *Vulli gaddalu*) is a bulbous herb with fistular leaves. It is cultivated throughout the Province for its edible bulbs. The dye is prepared by boiling a sufficient quantity of onion skins with some alum for half-an-hour. This gives a good yellow colour. The addition of tin will make the colour orange.

28. *Lichen dyes* Lichens are abundant in places above 2500 ft. in this Province, and are found in all mountainous places. Those that are growing on rocks are preferred to those growing on trees for dyeing purposes. It is used with wool for dyeing red, yellow and brown colours.

III Blue and shades of blue

29. *Indigo* is obtained from *Indigofera tinctoria* L. (Eng: The Madras indigo; Tam: *Neelam*; Tel: *Nili*) which is a bushy shrub growing to six feet in height. It occurs in Circars, Deccan and Carnatic, cultivated or run wild. *Indigofera sumatrana* Gaertn. (Bengal indigo) is also grown in this Province for this dye. Leaves yield a blue dye. It was used for

dyeing all kinds of fabrics throughout the world before the advent of the German aniline dyes.

IV Green Colour

Green results from the mixing of blue and yellow in varying proportions according to the shade of colour required.

V Grey Colour

30. *Pteris aquilina* L. (Eng: Bracken fern). The rhizome of this fern is stout, creeping underground, producing leaves (fronds) two to five feet long and one to two feet broad. It is common in all mountainous tracts of this Province. Roots and young tops yield an yellow dye. One ounce of iron and two ounces of cream of tartar are used as mordant. A quantity of young tops is boiled for half-an-hour, strained and silk is boiled in the decoction for about an hour for dyeing grey.

31. The infusion obtained by steeping the powdered rind of the fruits of *Terminalia Chebula* Retz. in water, imparts a grey colour to cloth.

VI Black Colour

32. Black colour is obtained by using the dried fruits of *Diospyros peregrina* Gurke in combination with the rind of those of *Terminalia Chebula* Retz. and ferrus sulphate. The black colour is also obtained by mixing up the rind of *Terminalia Chebula* Retz. with the pods of *Caesalpinia Sappan* L.

VII Purple Colour

33. The white portion of the flowers of *Nyctanthes Arbor—tristis* Linn. yields a purple dye known as *Gulkama*.

VIII Brown Colour

By different processes with Nos. 1 and 31, brown colour is obtained.

References

Listard, L. (1881) *Memorandum on Dyes of Indian Growth and Production*
Mairet, Ethel M. (1916) *Vegetable Dyes*
Watt, G. (1893) *Dictionary of the Economic Products of India.*

Importance of Plant Protection in Crop Production*

By T. V. RAMAKRISHNA AYYAR, B. A., Ph. D.

The slogan 'Grow more food crops' has now-a-days become so very infectious that at present we hear it from all corners and even from quarters where talk about such subjects connected with the boorish farmer of the uncivilised rural areas is generally considered outlandish and tabooed in high and refined social circles. It is, however, encouraging to note that persons in all walks of life are now beginning to realise the grim fact that the half-naked and ill fed farmer toiling in the out of the way fields and forests is the individual who has to satisfy the vital needs of every human being, be he a prince or peasant. In this particular aspect anyway, the present unfortunate world conditions have contributed to remind us all that it is on the foundation of agriculture that all human activities and thoughts depend in the last resort. The war and the events which have followed have demonstrated with great force the absolute dependence of all phases of industrial life upon the single industry agriculture, which, with its associated activities, forms the one primal, all-essential requisite in the successful prosecution of any enterprise whether war or peace. In the words of Prof. Maskew "the most important, the most vital thing in all the world is to get something to eat; if all of us here present, or mankind in general, were positively unable to obtain anything to eat for the space of one week, the affairs of this world, commercial or otherwise, would soon become of no more consequence than duckweed upon the surface of a pond. Without something to eat there would be no coal mined, no steel forged, no freight cars rolling. Agriculture in its broadest sense is the source of something to eat, and hence the original source of all subsequent action." As is usually the case sheer necessity is now driving us to evolve ways and means to provide the essential food materials which are getting insufficient and very costly as days pass. The suggestions to grow more food crops, to replace as far as possible other crops by cereals and pulses and to utilise all available cultivable space for such purposes are certainly commendable and every land owner and farmer will be well advised in following such laudable suggestions. It need hardly be added that in order to utilise all available areas to grow more food crops and to reap the benefits of such an endeavour several things are essential. Among these are the grant of land to poor farmers who are willing to take up such work either free or on very attractive conditions, freedom from Government taxes or liberal concessions in that direction, the supply of cheap seeds, free irrigation wherever available and even the loan of implements and cattle in many cases. Granting that all these facilities are arranged for and the *ryot* starts operations he has to remember that his duties do not end there; for in crop production the protection of the growing crops from the depredations

---

* Paper presented to the Indian Science Congress January 1943.

of the various agencies which cause it harm is a very important problem deserving as much attention as other aspects of the work to ensure his obtaining the expected harvest. For, inspite of the best attentions paid to the cultural, manurial and other requirements of the crop in the absence of proper protection the crop might often suffer severely at the hands of pests of different kinds. And especially so is the case when food crops are grown on a very wide scale all over the country and thereby unusual opportunities are offered for various noxious creatures to multiply abnormally and harm the crop in different ways.

Diseases and Pests of Crops Among the various agencies which play their part in causing partial or total damage to growing crops we have representatives both from among animals and vegetable organisms. The losses caused to growing crops by various agencies have been estimated in different countries and it is found that a very good portion of the estimated out-turn in each case is shared by the various crop pests According to Whetzel "the estimates of the plant disease survey of the U. S. A. Department of Agriculture indicate that approximately one bean in every dozen, one peach in every eight, one bushel of Irish potatoes in every twelve and one bushel of wheat in every ten are destroyed annually by disease in these crops." One can also have some general ideas of the whole-sale losses often caused to crops by such pests as locusts, swarming caterpillars and scale insects all over the world. The most noxious of all pests from the plant's point of view however is man. The enemies of growing crops are weeds of different kinds which either overgrow in the fields affecting the growing crops or are directly parasitic on them. There are also many small invisible micro-organisms like bacteria, fungi etc. which often levy their toll on the crops. Among animals we are all familiar with such higher forms like stray cattle and also wild animals like elephant, pigs, rodents, monkeys etc. in some out of the way areas. Among the lower animals the most important are insects and compared to most other agencies these play a very important and appreciable role as plant pests and the cultivator has to take special care against insects of various kinds some of which often completely destroy extensive areas of crops in an appreciably short period of time! An attempt is made in this very brief paper to offer a few hints to cultivators to help them to check insect pests of sorts which generally cause damage to growing crops with special reference to food crops, with which we are more concerned at the present time. Almost all growing crops and plants are found subject to the attentions of some insect or other and in some cases the different growing stages of individual crops have different categories of insect pests attacking them. It is therefore incumbent on the cultivator to be vigilant from the very early stages of the crop and nip in the bud any pest which appears on it.

Control Measures The different measures which can be adopted by man in the control of any pest, insect or any other organism, may be classed

into two groups - preventive or prophylactic and direct or curative; the former consist of such measures which help to deter or keep away a pest from appearing and the latter include such methods which are employed to destroy or check the further multiplications of a pest when it has already made its appearance. The well known saying 'Prevention is better than cure' is a very old maxim and is specially appropriate in many cases where we have to deal with diseases and pests of various kinds; but unfortunately the very sage advice contained in that pithy saying is more honoured in its breach than in its observance. It may be affirmed that in the case of many insect pests prophylactic measures will be found far more practicable and economical than those adopted to actually fight a desease or pest when it has made its appearance and when it often becomes too late to employ preventive measures, or too difficult to resort to curative methods. In certain special cases, none but preventive measures will be found practicable. It is only when we find it impossible or impracticable to adopt intelligent and prompt preventive measures that the need arises for resorting to what are called direct methods.

Preventive Measures The more important of the preventive measures which can be adopted against insect pests are the following:—

Field and Plant Sanitation Keeping the fields clean by removing all weeds is very important; it not only helps the growing crop to grow without competition but it also helps in checking the multiplication of some crop pests which feed on these weeds The removal of all crop remains after harvest such as stubbles of cereal crops, plant remains of such plants as sweet potato and cucurbitaceous creepers, brinjal plants etc. is also important since failure to remove these allows pests of such crops to breed unnoticed and appear on the same crops during the following season.

Cultural, Mechanical and Chemical Methods of Prevention Some of these measures though partially direct or curative go a great way in checking the multiplication of some pests and effecting their control easily and economically. These include deep ploughing to destroy weeds and white grubs attacking the roots of crops like chillies, cane etc., and for the destruction of the pupae of hairy caterpillars of sorts which are notorious pests this measure will be very useful. Apart from its purely agricultural effect scraping and cleaning field bunds will destroy eggs of grass hoppers especially in rice areas. Flooding of the fields when sufficient water is available will bring up underground pests like white grubs, cut worms, wire worms etc. which would otherwise emerge as adults to attack crops. Digging out and destruction of the nests of ants and white ants in and around any cultivated area will prevent these attacking growing crops especially white ants attacking crops like cane, wheat, groundnuts etc. Raking up and hoeing of the soil around cucurbitaceous plants and fruit trees will bring up the pupae of fruit flies which are bad pests of such crops and which get destroyed when brought to the surface by the weather or by birds etc. feeding on them. Treatment of setts of cane, grape vine etc.

with some chemicals like copper sulphate, crude oil emulsion, tar water etc. before planting prevents white ant, mealy bug and borer attacks during the early stages of the plant. Light Traps—Many insects including some well known crop pests are easily attracted to lights. The rice stem borer moth, the groundnut leaf miner moth, hairy caterpillar moths—of different kinds, cockchafer beetles of sorts, rice jassids and several important crop pests come to lights. A light trap may be kept at the very beginning of such crops so that the breeding of insects the adults of which get attracted to lights may be prevented. Any ordinary lantern kept hanging over a tray of kerosinated water will serve the purpose. Healthy seeds—The use of healthy seeds, cuttings, tubers, setts etc. for propagation will prevent the multiplication of some pests which remain hidden in the unhealthy seeds, tubers etc. and show themselves when the crop begins to grow. Growing of a trap crop—When an important insect is known to infest more crops than one the less important crop is grown as a trap to entrap the pest earlier to save the more important crop; this is of course not possible in all cases The growing of pest resistant varieties of crops—Though this is an ideal, extremely desirable and a very easy method to prevent pests, we have not unfortunately advanced sufficiently well in evolving such pest resistant strains of crops which will stand the test uniformly. As a method for control of pests and diseases the use of resistant varieties of plants suffers from severe disadvantages even according to experts in genetics. A few of these are (1) Plants resistant to more than one disease are rare (2) There exist biological varieties or races of some disease or pest with different habits and so the resistance in one locality disappears in another due to such forms (3) Examples of absolute resistance are not only very few but even in such cases absolute resistance is found to be short lived. An equally encouraging method of pest control, with of course, numerous complexities as in the above method, is what is known as the Biological method of pest control—the use of natural enemies to control a pest. So until we reach better and surer results in these methods by further investigations and trials we have to resort to some of the ordinary practical measures noted above which will in many cases not only prevent the outbreaks of pests but in some considerably minimise the damage even if the pest appears. It is needless to add, however, that the success or otherwise of most of these measures depends a good deal on the promptness with which they are adopted and in the present emergency we cannot afford to resort to experimental measures.

Direct methods Coming to direct methods we could adopt mechanical, physical and chemical measures of different kinds suited to different categories of pests. More important among these methods include hand picking, netting, bagging, jarring, use of sticky boards, use of fly, moth and maggot traps, trenching and creating barriers preventing some pests which move from field to field in swarms. Many of these methods will be found extremely effective and economic if employed at the proper time. Many

insects like plant bugs, weevils, grasshoppers, flea and plant beetles, cockchafers, leaf hoppers etc. can be easily checked by handpicking, netting, jarring, bagging etc. which are simple contrivances and could be taken up by even the poorest *ryot*. Handpicking of hairy caterpillar moths, egg masses of borers, beetles, butterflies, moths etc. of plant caterpillars like those of citrus, castor and other crops will be found extremely effective and economic if resorted to in proper time.

Coming to the physical and chemical methods of insect pest control we all know that they have been in vogue in some form or other from time immemorial in various crude ways mostly as empirical and rule-of-thumb measures and it is only within the last century that scientific and rational use of such methods have come into vogue. Even these have their limitations. Some of those methods either physical or chemical might be very effective in killing a pest infesting a crop but the most important point to remember is that in killing the pest we must not also kill the crop thus making the remedy worse than the disease. Only such measures could therefore be adopted which, while killing or driving away the pest, should not in any way affect the healthy growth of the crop concerned. The artificial application of high and low temperatures which may be useful against some insect pests cannot be successfully adopted in the case of most growing crops. As regards the choice of suitable chemicals of different kinds, it depends a good deal on the nature of the damage done by a particular pest; generally those which remove and eat up the plant tissue are treated with insecticides known as stomach poisons which when they enter the stomach of the insect with the food material poison the creature and kill it; against those insects which suck up the juice of plants without removing the tissue, as in the former case, the materials used are known as contact insecticides which when they come into contact with the insect's body suffocate and kill it. There are numerous insecticides now in use belonging to each of these two main categories, for biting forms like grasshoppers, caterpillars, beetles etc. and sucking forms like plant lice, scales, plant bugs, mealybugs etc. Most of the stomach poisons now in use are unfortunately dangerous drugs (chiefly arsenic compounds) which are poisonous to both animals and man and as such their use can be safely carried out only by trained hands. In a country like India where the majority of the cultivators are illiterate, such remedies in their hands are likely to cause more harm than good. The recommendation of such dangerous and risky poisons, however effective in their own way as pest controls, is a matter which demands very serious and weighty considerations. Leaving aside that aspect of the question for the present we have first to examine and find out whether it will be advantageous to the average farmer of the Indian plains to adopt insecticidal measures of pest control against all his pests. Every one who has any correct ideas regarding agricultural conditions prevailing in India, especially regarding the comparatively small size of the Indian holdings, their proverbial poverty and the equally poor returns got out of

such staple food crops like rice, millets etc. can at once find out that insecticidal measures against pests on such field crops are quite impracticable and uneconomic. On the other hand, experience has shown that the use of insecticides to fight pests infesting valuable and well paying crops like cotton, tobacco, sugarcane, fruit trees etc. are quite a practical and economic proposition. Nor is it a practical proposition in these days when such insecticides and appliances become non-available. Until therefore we are in a position to find out local preparations which are harmless to handle and which are easily available we have to be very careful in the use of poisonous insecticides. It will therefore be found that while modern methods of insecticide application might be suitable in the case of pests on paying industrial crops of different kinds the poor farmer growing food crops has to depend mainly on practical, cultural and mechanical methods. To put the whole subject briefly the safe guarding of the growing food crops needed for our modern emergencies from the ravages of insect pests depends a great deal on the proper attention and care bestowed on them by the cultivator all through the season and resorting to preventive and easily workable direct measures—unlike the absentee landlord who sows his seeds and returns to the fields only at harvest time. It has to be remembered that by our present efforts to raise crops in all available lands we are offering exceptional temptations to some of our worst pests to enable them to extend their nefarious activities to wider fields; as such greater attention has to be paid in the directions of the proper selection and preparation of the soil, sufficient manuring and irrigation and in preventing the attacks of diseases and pests.

In conclusion it has however to be strongly emphasised that in all measures of plant protection, especially in the case of small holdings, unless there is co-operation between farmers of adjacent plots--especially when we get mass attacks of pests like grasshoppers, cut worms, plant hoppers etc. in any area, the methods earnestly adopted by one or two individuals will not have any benefit. It need hardly be added that it is the important duty of the Government Agricultural Departments also to help the poor farmer in all ways to protect his growing crops so that he may get the expected returns for his labours.

Inheritance of Characters in Safflower—*Carthamus tinctorius* L.

By M. VENKOBA RAO,
Agricultural Research Station, Hagari

Introduction The safflower is an oil-seed crop belonging to the natural order *Compositae.* This was once grown extensively in Bengal, United Provinces, the Punjab, Bombay and the Central Provinces for the extraction of an yellow dye, carthamin, from the florets of this plant, but with the introduction of synthetic dyes, this industry has ceased to exist, and the importance of this crop has very much dwindled. It is now grown merely for the sake of its oil. The seeds when crushed yield a clear straw-coloured oil which is largely used for culinary purposes. In the Madras Presidency this crop is cultivated chiefly in the black soils of the Ceded Districts, the largest area being in the Bellary district. Little known outside the Ceded Districts it does not find a place in the Season and Crop Report of this Province. This crop is sown in October--November and is harvested by February. It is usually sown as a mixture with coriander, sorghum or wheat. As a pure crop it is sown only along the borders of fields where its spiny bracts serve as a protection against cattle trespass.

The literature regarding this crop is rather scanty. The earliest reference is in the Commercial Products of India, Watt (1908), where a general account of this crop is given and the existence of two types of plants, the spinose and the spineless, is recognised. Howard *et al* (1915) published detailed descriptions of 34 types. Subsequently Sabnis and Phatak (1935) have made a classified list of 63 types, based on the flower colours and on the nature and shape of bracts. At the Agricultural Research Station, Hagari, selection work on this crop has been in progress for some time and the mode of inheritance of a few plant characters has also been studied incidentally. The results obtained are recorded in this paper.

Spinose and spineless types In safflower two distinct types, the spinose and the spineless can be distinguished. In the spinose type the tips and margins of the involucral bracts as well as those of the upper leaves become stiff and spiny, while in the spineless the bracts and leaves are devoid of any such outgrowths. The difference between the two types becomes very marked when the flower heads appear. With regard to the genetic behaviour of these two characters mention is made in the Scientific Reports of the Pusa Institute (1931 to 1934) that the spineless behaves as a recessive to its allelomorph spinose in a 1:15 ratio as a result of duplicate factors. The inheritance of these characters were studied at Hagari in a number of artificial crosses and it was found that the spinose type behaved as a simple dominant to the spineless type (Table I).

Bloomy and bloomless types Another differentiation of types has been made out from the presence or absence of heavy bloom on the inner

bracts of the involucre. This bloom gives a whitish appearance to the plants when the flower heads appear, while plants without such bloom appear green. An examination of the several types grown at this Station showed that bloom is present in all types, the density of the deposit alone being either heavy or sparse. Sabnis and Phatak (1935) in their classification of Indian safflowers describe these two types as "Inner bracts felted and white" and "Inner bracts smooth and green". This "felted and whitish appearance" is due to the heavy deposit of whitish, waxy and hairlike outgrowths on the surface of the involucral bracts. A study of the segregations for these two characters showed that the heavy bloom behaves as a simple dominant to sparse bloom (Table II).

TABLE I. Segregation for Spinose and Spineless bracts

Generation	Selection number	Character of selection	Behaviour of progeny Segregating for	
			Spinose	Spineless
Parents	C. T. 53			♀
	C. T. 62		♂	
F. 1	Cross 28 & 29		Spiny	
F. 2	From cross 28 :— C. T. 304 & 305	Spiny	63	24
	From cross 29 :— C, T. 331 to C. T. 335	,,	496	156
F. 3	From C. T. 304 : — C. T. 304/1, 3, 7, 9, 11	,,	525	166
	,, 304/2 & 8	,,	Pure	,,
	,, 304/6 & 10	Spineless	,,	Pure
	From C. T. 305 ;— C. T. 305/1, 2, 4 to 5	Spiny	649	229
	,, 305/5 & 8	Spineless	,,	Pure
		Total	1733	575
		Expected (3:1)	1731	577

$X^2 = 0\ 0092$, P between 0·95 & 0 90.

TABLE II Segregation for Heavy Bloom and Sparse Bloom

Generation	Selection number	Character of Selection	Behaviour of progeny Segregating for	
			Heavy bloom	Sparse bloom
Parents	C. T. 53		♀	
	C. T. 62			♂
F. 1	Cross 28 & 29		Heavy bloom	
F. 2	From cross 28 :— C. T. 304 & 305	Heavy bloom	68	19
	From cross 29 :— C. T. 331 to C. T. 335	,,	494	158
F. 3	From C. T. 304 :— C. T. 304/1, 3, 6, 9 to 11	,,	648	221
	C. T. 304/4 & 8	,,	Pure	
	C. T. 304/2, 7 & 8	Sparse bloom		Pure
	From C. T. 305 :-- C. T. 305/1, 2, 4 to 7	Heavy bloom	659	219
	C. T. 305/3 & 8	,,	Pure	
		Total	1869	617
		Expected (3 : 1)	1864·5	621·5

$X^2 = 0{\cdot}1303$, P between 0·8 & 0·7

Linkage relationship When the interactions between the two pairs of characters, spinose and spineless and heavy bloom and sparse bloom were studied, it was found that a linkage existed between the two sets of allelomorphs with a cross-over value of 13%±2%. Table III (a) and (b) give the relevant data, in the coupling and repulsion phases respectively.

TABLE III. Linkage between spininess and bloom

Generation	Selection number	Character of selection	Behaviour of progeny Segregating for			
			Spinose		Spineless	
			Heavy bloom	Sparse bloom	Heavy bloom	Sparse bloom
		(a) Coupling phase				
Parents	C. T. 63		♂			
	C. T. 231					♀
F. 1	Cross 9		F. 1			
F. 2	From cross 9:—					
	C. T. 291	Spinose, heavy bloom	109	11	8	30
	Expected @ 13% Cross-over		110	9	9	30
	X^2 = 0·6547, P between 0·95 & 0·90					
		(b) Repulsion phase				
Parents	C. T. 53					
	C. T. 62					
F. 1	Cross 28 & 29		F. 1			
F. 2	From cross 28:—					
	C. T. 304 & C. T. 305	Spinose, heavy bloom	45	18	23	1
	From cross 29:—					
	C. T. 331 to 335	,,	339	157	155	1
F. 3	From C. T. 304:—					
	C. T. 304/1, 3, 9 & 11	,,	291	144	136	2
	From C. T. 305:—					
	C. T. 305/1, 2, 4 to 7	,,	432	217	227	2
		Total	1107	536	541	6
	Expected @ 13% cross-over		1103	539	539	9
	X^2 = 1·0386, P between 0·8 and 0·7					

Normal and rosette types In the course of these studies one late type, C. T. 12, was isolated, which had numerous close-set radial leaves resulting in a rosette-like appearance. The plants of this type were similar to the erect and late types, Nos. 1, 2, 5 and 15 among the Pusa types (Howard *et al*, and Sabnis and Phatak). The genetic behaviour of this type of plant-habit was studied and the data are presented in Table IV. It would be seen that Rosette is a simple recessive to the normal type and is also inherited independently of spininess.

TABLE IV

Generation	Family number	Character of selection	Behaviour of progeny Segregating for: Spinose		Spineless	
			Normal	Rosette	Normal	Rosette
Parent	C. T. 12					♀
F. 1	Natural cross		F. 1			
F. 2	C. T. 81	Spinose, normal	199	59	56	21
F. 3	From C. T. 81—					
	C. T. 143 to C. T. 148	,,	795	290	272	104
		Total	994	349	328	125
		Expected (9:3:3:1)	1010·25	336·75	336·75	112·25
			$X^2 = 2{\cdot}3827$, P between 0·5 and 0·3			
	C. T. 150	Spinose, normal	Pure			
	C. T. 149	,,	106	34		
		Expected (3:1)	105	35		
			$X^2 = 0{\cdot}116$, P between 0·8 and 0·7			
	C. T. 152	Spinose, rosette		Pure		
	C. T. 151, 153 and 154	,,		222		66
		Expected (3:1)		216		72
			$X^2 = 2{\cdot}000$, P between 0·2 and 0·1			
	C. T. 155 and 156	Spineless, normal			Pure	
	C. T. 157 and 158	,,			536	185
		Expected (3:1)			540·75	180·25
			$X^2 = 0{\cdot}5004$, P between 0·5 and 0·3			
	C. T. 159 and 160	Spineless, rosette				Pure

Floret colours The flowers in *Carthamus tinctorius* are arranged in composite heads. The florets, which are all tubular in this genus, exhibit four different colours ranging from white to orange. The existence of such colour differences has been recorded by Howard, Howard and Khan (1915) and their description of the Pusa types is based mainly on these variations in flower colours. Sabnis and Phatak (1935) also, have taken the floret colour-groups as the basis for their classification of Indian safflowers.

The colour groups referred to above are as follows:—

(i) *Orange* Florets yellow when fresh, developing a reddish tint on fading and drying finally to orange. This is the commonest and most predominant type in the Bellary area. The flower buds are yellow, but these too, if injured develop a reddish colour at the tips.

(ii) *Red* Florets reddish orange while fresh and deep red on drying.

(iii) *Yellow* Florets yellow both when fresh and dry. Both the buds and florets resemble type (i) when fresh, but does not change colour on drying.

(iv) *White* Florets white, which when dry turn creamy white.

These four types have been described by Sabnis and Phatak as (i) florets yellow, turning red on fading, (ii) florets reddish orange, turning to deep red on fading, (iii) florets yellow turning to brownish yellow on fading and (iv) florets white.

These four types can easily be distinguished, the colours being quite stable and recognisable even long after the plants have matured and dried up. In the inheritance studies recorded below, orange, red, yellow and white refer to the colour of the dry florets.

Inheritance of floret colours Mention is made in the Scientific Reports of the Pusa Institute (1935-36) that orange and yellow are both dominant to white. At this station, numerous single-factor segregations for flower colours, have been recorded, from various natural and artificial crosses. These are summarised in Table V below.

TABLE V

Colour groups	No. of families Studied	Actual numbers	Expected numbers on 3:1 ratio	X^2	Probability
					P between
1. Yellow & white	4	477:152	472:157	0·2336	0·5 & 0·7
2. Red & white	10	1347:430	1333:444	0·6186	0·3 & 0·5
3. Red & yellow	5	418:130	411:137	0·4764	0·3 & 0·5
4. Orange & white	2	410:132	407:135	0·1206	0·7 & 0·8
5. Orange & yellow	7	778:253	773:258	0·0934	0·7 & 0·8
6. Orange & red	14	1753:579	1749:583	0·0092	0·9 & 0·95

It is seen from the table that (1) orange is dominant to red, yellow and white, (2) red is dominant to yellow and white and (3) yellow is dominant to white, each with a single factor difference. This indicates that three factors are necessary for the manifestation of the orange colour, two for the red and one for the yellow.

In table VI are given the two-factor segregations observed in the floret colours. It would be noted that all of them are modified 9:3:3:1 ratios where the last two groups get merged into one, due to the interaction of factors.

TABLE VI

Colour groups	Actual numbers	Expected numbers on 9:3:4 ratio	X^2 and probability		Remarks
				P between	
1. Red: yellow : white	98: 26: 38	91: 30: 41	1·3031	0·5 & 0·7	Artificial cross
2 Orange: yellow: white	93: 39: 44	99: 33: 44	1·4780	0·3 & 0·5	Do.
3. Orange: red: white	692:226:304	687:229:306	0·0888	0·95&0·98	Natural cross
4. Orange: red: yellow	281:113:127	293: 98:130	2·8567	0·2 & 0·3	Artificial cross

TABLE VII Inheritance of Flower colours in Safflower

Gene-ration	Selection Number	Parental constitution		Segregating for				X^2	Probability P between
		Pheno-typic	Genetic	Orange	Red	Yellow	White		
Parents	C. T. 18 C. T. 40	White Yellow	OORRyy oorrYY			♂	♀		
F. 1	Cross I			Orange					
F. 2	C. T. 307, 308 and 309 Expected on 27 : 9 : 12 : 16 ratio	Orange	OoRrYy	260 268	103 89	120 119	151 158	2·7605	0·5 & 0·3
F. 3	Selections from C. T. 308								
	C. T. 308—1, 5, 11, 14, 16, 18, 19 Expected on 27 : 9 : 12 : 16 ratio	Orange	OoRrYy	487 446	142 148	173 198	254 264	7·496	0·1 & 0·05
	C. T. 308—3, 4, 7, 10 Expected on 9 : 3 : 4 ratio	Orange	OORrYy	380 375		121 125	166 167	0·2007	0·95 & 0·90
	C. T. 308—8, 13, 15, 17 Expected on 9 : 3 : 4 ratio	Orange	OoRrYY	319 311	110 104	124 138		1·9722	0·5 & 0·3
	C. T 308—20 Expected on 9 : 3 : 4 ratio	Orange	OoRRYy	30 31·5	10 10·5		16 14	0·2381	0·9 & 0·8
	C. T. 308—2 9 Expected on 3 : 1 ratio	Orange	OORRYy	232 226			69 75	0·6921	0·5 & 0·3
	C. T. 308—6, 12 Expected on 3 : 1 ratio	Orange	OORrYY	221 226		80 75		0·3998	0·7 & 0·5
	C. T. 308—21, 24 Expected on 9 : 3 : 4 ratio	Red	ooRrYy		179 183	55 61	92 82	1·8971	0·5 & 0·3
	C. T. 308—22 Expected on 3 : 1 ratio	Red	ooRrYY		122 124	44 42		0·0201	0·9 & 0·8
	C. T. 308—25, 26, 27, 28 Expected on 3 : 1 ratio	Yellow	{oorrYy OOrrYy}			487 491	168 164	0·1471	0·8 & 0·7

The above data (Table VI) suggests the following hypothesis. The basic colour of the florets is yellow and is due to a factor 'Y'. In the absence of this factor no colour can develop and the florets remain white. A supplementary factor 'R' acting in conjunction with 'Y' produces red colour. A third factor 'O' with 'R' produces the orange colour, but as 'R' itself requires the presence of Y for manifestation, the orange colour would contain all the three factors O, R and Y. Factor 'O' cannot develop the orange colour without 'R' nor can 'O' and 'R' produce any colour without the basic colour factor Y. On this hypothesis the genetic constitution of the four types of floret colours would be as follows—

Phenotype	*Genetic constitutions*
Orange	OO RR YY
Red	oo RR YY
Yellow	oo rr YY, OO rr YY
White	OORRyy, OOrryy, ooRRyy, oorryy

With the object of testing this hypothesis, a cross was made between C. T. 18 a white with the constitution OORRyy and a yellow (C. T. 40) of the constitution oorrYY. The behaviour of this cross was studied up to the third generation and it was found to substantiate the above hypothesis in all respects. The data are detailed in Table VII.

The inheritance of these floret colours was found to be independent of the nature of the bracts, (spiny or spineless), as seen from the data presented in Table VIII.

TABLE VIII

Generation.	Selection number	Nature of parent	Segregating for: Spiny Orange	Spiny Red	Spiny White	Spineless Orange	Spineless Red	Spineless White
F. 2	C. T. 34/1	Spiny natural cross from spineless white bulk lot C. T. 34.						
F. 3	C. T. 119	Spiny orange	14	3	6	3	2	2
F 4	*From C. T. 119*							
	C. T. 181	,,	100	32	43	33	15	15
	,, 182	,,	78	40	33	29	7	10
	,, 184	,,	101	50	42	32	12	18
	,, 189	,,	141	43	66	52	7	23
		Total of F. 3 & F. 4	434	148	190	149	43	68
	Expected on 27 : 9 : 12 : 9 : 3 : 4 ratio		435	145	194	145	48	65

$X^2 = 0{\cdot}9165$ P is between 0·98 and 0·95

Summary In safflower (*Carthamus tinctorius* L.) the mode of inheritance of a number of characters have been studied and recorded.

Spinose bracts behave as a simple dominant to spineless. Sparse bloom on the involucral bracts behaves as a simple recessive to heavy bloom. The two sets of allelomorphs were found to be linked with a

cross-over value of 13 %. Rosette-like arrangement of leaves was a simple recessive to the normal. This character was independent of spininess.

Four types of floret colours viz. orange, red, yellow and white have been observed. The genetic inter-relationship of these four colours are explained on a three factor hypothesis.

There is a basic factor 'Y' for colour, due to which the florets are yellow. In the absence of this factor no colour can develop and the florets are white A supplementary factor 'R' produces the red colour in the presence of 'Y'. A third factor 'O' develops the orange colour in conjunction with 'R' which in turn is dependant on 'Y', the basic colour factor, for its manifestation

The inheritance of these flower colours were found to be independent of the nature of bracts.

Literature cited

Howard, A., Howard, G. L. C. and Khan, A. R. (1915) *Mem. Dept. Agric. India Bot.* 7, 237—55.

Sabnis, T. S. and Phatak, M. G. (1935) *Indian J. Agric. Sci.* 5, 705—14.

Sci. Rep. Agric. Res. Inst. Pusa 1931 to 1936.

Watt, G. (1908) *Commercial Products of India.*

A Plea for Reviving the Omblachery Breed of Cattle in the Tanjore District

By R. SESHAYYA, M. A., B. L.,

Secretary, Tail-end Association and

Member, District Agricultural Association

Omblachery breed The district of Tanjore, familiarly known as the "granary of the South", is also reputed from time immemorial, for its sturdy cattle, in relation to its agricultural economy. The *ryots* of the district have been depending for long, for their agricultural operations on a well-suited local breed of cattle known as the "Omblachery breed", taking its name from a village called Omblachery, in the Taluk of Tiruturaipundi. The bullock of this breed is a sturdy worker, both at the wheels and at the plough. It is of medium size with a comparatively small head. Its complexion is, generally, bluish grey, and it has a white star on its fore-head. It has shining dark eyes and wears a few thick hairs, on its chin. Its tail is black above the thighs and ends with a lotus like brush of snow-white hair, soft and glossy like silk. Its hoofs are equally white and resemble ivory, in their finish. The pure bred pedigree sire is generally ferocious by nature. Owing to the large demand for this breed of cattle and due to lack of organised effort in breeding in the past decade, its population in the village of Omblachery has slowly dwindled At present, the pure stock is very rare and outnumbered by those of mixed blood. The pure breed is known throughout the district, as the *jothi madu.*

At present, according to an Omblachery breeder-*ryot*, there are only about thirty cows, and but five bull calves which may be considered as typical of the breed. Recently, at a meeting of the Taluk Agricultural Association, Tiruturaipundi, the members were reliably informed that the wealthy *mirasdars* of the district were trying to secure, at any cost, the surviving calves for their use and that owing to the owners' unwillingness to part with them, these calves have not changed hands. We were further given to understand that unless early steps were taken by the Government to purchase and maintain them in Government Farms the race of the pure breed would be extinct once for all.

Pasture The village of Omblachery is about seven miles by road from Tiruturaipundi Town, and four miles from the nearest Railway Station of Kariyapatnam, on the Tiruturaipundi—Point Calimere Branch of the S. I. Railway. The village is very near to the sea and lies on the Coromandel Coast and bears a bracing climate. About forty *velis* or about 270 acres of pasture land have been set apart as communal grazing area and the soil is rich in calcium salts so essential for building a race of sturdy bulls suited to heavy ploughing duties. A small river running through the grazing area and falling into the sea takes back large quantities of high tide sea water during summer, and this serves as a good nervine tonic to the entire cattle, that resort to them for their daily wash and for quenching their thirst. The varieties of fodder generally found on the pasture, are, *kai korai, neru netti korai, manji pillu, pillipessara* and other varieties peculiar to coastal areas. The breeding operations are specialised by the *ryots* of the village, while a few of the neighbouring villages having communal rights in the village also join in them. Only two houses have earned a district-wide repute for the quality of the animals bred by them, and their animals are called the *Vannan madu* (the *Dobhi*) and the "Ganesa Iyer *madu*". The cows and the breeding bulls of the village are not dehorned.

According to the information furnished by the *ryots* of the village every cow-calf would become fit for its first service, at the age of four, and later the spacing would extend over two-and-a-half years for every subsequent calving. The cows bear thin wiry frames of strong bones and nerves and their milk-yield is rather scanty, and meagre in quantity. Hence the young ones are allowed to run away with their mothers to the pasture so soon as they could walk distances without detriment to their safety and health. When the calves are but six months old, they are fed in addition to their mother's milk, on a mixture of half-a-Madras measure of water-soaked brown rice, one seer of ground-nut cake, about two seers of bran, mixed with an ounce and a half of common salt. The feeding is done by the women-folk of the house-hold at regular intervals of the day, and the calves run up for their grub at the appointed hour when called on by their pet names.

Marketing methods No organised marketing is done as in fairs and festival days. Calves even at the age of six, seven and eight months, are sold away by needy owners to shrewd middlemen *mirasdars*, who sell them

to others at fancy prices. A full grown bull fetches generally three-hundred rupees, while calves do at least sell at a hundred per head. In view of the racy market for it by the richer section of the ryots of the District, the poor live-stock-owner cannot afford to own them long. Hence there is a danger of their extinction altogether, as a breed.

The case for revival of the breed The plea for reviving and increasing the number of the pure blood through Government patronage, gains support from the admissions of the Veterinary and the Agricultural Departments, as to their hardihood and endurance in facing and shouldering tough agricultural duties all the year round, their medium size and wiry frames suited for ploughing operations of clay soil and above all their comparatively low cost of maintenance--all qualities in a bull to be plumped for by the poor live-stock owner *ryot*. It is further significant to be told that because of the lack of patronage from Government quarters, in the way of grant of premium benefits to breeders, the breed has fast been disappearing.

Suggested reforms (1) Reinclusion of the breed in the schedule entitled to premium benefit, by the Veterinary Department. (2) Opening a model farm at Omblachery village, with a view to increasing the pure breed. (3) The immediate purchase of the surviving calves for purposes of the proposed farm. (4) Launching a co-operative enterprise with the subscribed capital of the Mirasdars of the district with objects, such as, (a) the immediate purchase, upkeep and maintenance of all available cows of half and three-fourths blood, (b) the purchase and maintenance of sufficient land for pasture and for growing cattle fodder, (c) assumption of rights and powers of exclusive marketing by or through their agency, (d) the imposition of a ban on the sale of heifer calves for a period of ten years from date of commencement of the said farm, and further ban on all sales of them to butchers Other measures incidental to and in furtherance of the objects may also be adopted. But it is urgently in the interests of the live-stock improvement of the District that early steps are taken by the authorities for reviving the reputed "Omblachery breed."

SELECTED ARTICLES

Notes on Erosion

By SIR A. TOTTENHAM, C. I. E.,
Administrator, Pudukottai

Erosion is a world-wide problem. Europe is the continent least affected, though even in parts of Europe, for example the Russian steppes, erosion is a serious problem. In America, Asia and Africa its importance cannot be exaggerated. In regard to Africa, General Smuts has said 'Erosion is the biggest problem confronting this country; bigger than any politics'. The Darbar consider that in our own State anti-erosion work is more important than even Medical Relief or Education. But, until the public have been further educated in the importance of this work, it would be hopeless to give it the priority to which it is entitled in our Budgets.

Erosion is of two main kinds, erosion due to wind, and erosion due to water. Erosion due to wind is of little or no importance in our State, though there is reason to believe that in Coimbatore, and perhaps other Districts of the Madras Presidency, it is of much greater importance. How important it is in the U.S.A. may be learnt from the story told by Stuart Chase in that terribly interesting book *Rich Land, Poor Land* that an old Nebraska farmer was sitting on his porch during a dust storm. Asked what he was watching so intently, he replied 'I'm counting the Kansas farms, as they go by'! In Pudukkottai we have to deal with erosion due to water.

This begins as 'sheet erosion', which most people would not notice at all. Layer after layer of the soil is peeled off, and finally, after less than a foot, it may be, is gone, what the Americans call 'hard-pan' is reached, which is infertile, at all events unless it has been ploughed up, and exposed to the action of the atmosphere for some time. For the time being, at all events, the soil is devoid of plant-food. Then come gullies, small at first, increasing rapidly, and finally forming gorges, perhaps 20 feet deep. There are such gorges in our State, for example at Ariyur *vari*, and Tudayamparai. As the process goes on large areas of rock are laid bare, as can be seen at the places already mentioned, and at many others in the State, among which may be mentioned Manaturai *vari* (which feeds Valnad *Periyakulam*) and Ponnechchikulam, both in Alangudi taluk.

It must always be borne in mind that—apart from the serious silting up of the tanks caused by erosion—it is not a mere question of transporting soil from one place to another, where it may be equally useful. Whatever may be the nature of the silt carried by the Nile in Egypt, and some of the large rivers in China, the silt formed by erosion in our State is *infertile*, owing to the changes in the physical and chemical structure and composition of the soil that it undergoes, when carried to any distance by water. In their book *The Rape of the Earth*, Jacks and Whyte say 'The water breaks down the transported soil-crumbs into their constituent particles of sand, silt, and clay, thereby destroying most of the characteristic soil properties and fertility, so that even when the eroded particles are redeposited on cultivable land, they have lost much of their productive capacity'. (p 33).

It is not too much to say that, unless effective measures are taken to check erosion in our State, within a measurable time—it may be a century, it may be more, or less a very large part of the high grounds, such as are common in the Alangudi and Tirumayyam taluks (there is much less erosion in Kulattur taluk, probably owing to the fact that there is less laterite in the subsoil there and more gneiss) will have been reduced to a desert of bare and eroded rock, scarred by horrifying ravines, incapable of supporting any form of life,—human, animal or vegetable; while all the tanks will have been silted up, and most of the cultivable lands destroyed by the deposit of infertile silt.

All books on this subject lay stress on the fact that this artificial or man-caused erosion, as opposed to natural erosion, which is on the whole a beneficial process, is of *recent origin* Such appears to be the case in our State. In fact, if erosion had been proceeding for any considerable period at the same pace as at present, the condition of the State would already be such as has been foretold above. The *Vattam Karnam* (village accountant) assured the writer that where the appalling Ariyur ravine now is, forty years ago there was no ravine at all. That this is literally true the writer cannot guarantee, but it seems not unlikely.

What started it? The clue may possibly be found in the following quotation from the State history. "It may be mentioned that the Resident made arrangements for clearing the forests and increasing the cultivable area of the State. In 1826 in reply to a question of the Governor to the Raja whether the country

was covered as much with woods as before, the Raja informed him that 'agreeably to his father the Colonel's' (i. e., Col. Blackburne's) 'order, the woods had been almost cut down, and that cultivation was going on, some thin wood remaining still in some places'. The fact remains, however, that in some of the areas where erosion is worst there is still a good deal of scrub jungle, and of course there was never high forest in Pudukkottai.

Cart-tracks are a fruitful cause of gullying. This is mentioned by Lord Hailey in his work on Africa. In any area where erosion is in progress the process can be seen by which at first small gullies are formed by the wheel tracks, then these are deepened, till the cart-track has to be abandoned, and another route is taken by its side, while the original track cuts deeper and deeper till a formidable gully is formed, to grow in due course into a ravine.

Nothing had been done to check erosion till some six years ago. Attention had been concentrated entirely on the silting-up of tanks, which it was sought to check by building expensive masonry grade-walls at the *bottom* of the *varis* leading into the tanks. Owing to their cost, these could only be few, whereas hundreds—nay thousands—are required. They were not particularly effective, even in stopping silt reaching the tanks. An idea was entertained that the silt deposited behind them might be removed in lorries, but of course this was never done. The cost would have been prohibitive, and it would have been difficult to find a place to dump the silt, whence it would not at once have washed down into another tank, or some cultivable fields. The problem of the rapid denudation of the *uplands* was of course not touched at all. It was like putting a basin on the floor to stop a leak in the roof!

What we now aim at is *preventing denudation and consequent formation of silt*, not merely the disposal of silt after it has formed, and after valuable soil has been carried away from the uplands and defertilized. The cardinal principle that has now been adopted is that anti-erosion work must begin at the *top* of the eroded area, and work down to the bottom. Rubble dams have been built in very large numbers, and earthen bunds formed to check surface-wash. Dams formed of the trunks of palmyras (*Borassus flabellifer*) were tried at first, and would have been very cheap, but were not a success, owing probably to seasoned timber not having been used.

Steep banks have been terraced, and on the bunds and terraces various kinds of grass have been sown. Two African species have been tried, Kikuyu grass (*Pennisetum clandestinum*) which had already been cultivated at Kodaikanal, and Giant Star grass (*Cynodon plectostachyum*) which was specially obtained from Kenya and Pretoria. Various indigenous grasses have also been tried. The Kikuyu grass has not proved successful, but the Giant Star has done well in some places, Much more remains to be done in this direction.

A considerable area adjoining Manaturaivari has been ploughed with the State motor tractor, *along the slope*, and *Cholam* (*Sorghum vulgare*) sown. The ploughing is of course very beneficial, but the *Cholam* was sown at the wrong time and failed. Aloes (*Agave*), Cashew (*Anacardium occidentale*) and *Virali* (*Dodonaea viscosa*) are other species planted or sown. Owing to the comparatively cheap nature of these expedients, a good deal of work has been done in half a dozen places, and a steadily increasing allotment is being made for these works in the Budget.

The *ryots* were at first by no means convinced that these works were to their advantage. They said that they were cutting off the supply to their tanks; which in any case were doomed to destruction sooner or later, if nothing was done—a fact that they did not grasp—though actually the ultimate effect of the works must be to improve the water supply, by raising the general water-level in the

upland sub-soil, while checking the velocity and reducing the violence of floods. Now, it is believed that many, even of the *ryots*, are beginning to see how beneficial these works are.

What the Darbar are doing at present is but little, it is true, having regard to the magnitude of the problem. Lakhs, perhaps crores, might be spent on it. That is not possible, but the Darbar consider that it is better to go on methodically, year after year doing what little they can, rather than to do nothing. They do not subscribe to the principle 'Posterity has done nothing for me, so there is no reason why I should do anything for posterity'.

Addendum to Notes on Erosion The Darbar must not omit to mention the valuable advice that they received from Rao Sahib E V. Padmanabha Pillai who was lent for a short time by the Madras Government to study the problems of erosion in the State, and advise as to the methods to be taken to deal with them. He visited the State from 28th August to 7th September, 1938 and again from 21st January to 1st February 1939, and wrote a useful note on the subject, which the Darbar had printed.

An appeal to Tanjore *ryots* *

By M. S. SIVARAMAN, I. C. S.,

Collector and President, District Agricultural Association, Tanjore.

There is an impression among many that paddy cultivation which has been in vogue from time immemorial in Tanjore District has reached a high level of perfection. But the truth is that no proper attention is paid to cultivation in this district. The average outturn realised is 25 *kalams* per acre which is about one-third of the yield per acre in the Aduturai Farm and one-fourth of the yield per acre in Spain and Japan.

The reason for this low outturn is the deficiency of the bulk of the soil of the delta in the two vital elements, nitrogen and phosphoric acid, which are essential for the successful raising of paddy. The existing manurial supplies are totally insufficient to replace the elements taken off the lands by the crops raised and there has been a gradual deterioration of the soil which has gone on for centuries. It is necessary that more attention should be paid to the proper manuring of the lands if the average outturn of the district is to be anything like what it ought to be.

Can the *ryot* repair the damage done in the course of centuries and secure a better outturn in the immediate future without much extra expense? He can, if he follows the advice of the Tanjore District Agricultural Association. He can increase the av rage yield of the district by over a hundred per cent even in the course of two years.

The deficiency of nitrogen can be made good by green manuring. The Association has distributed seeds of several kinds of green manure plants like *daincha*, *pillipesara*, sunhemp, *karumpayar*, *kolinji* and *Sesbania speciosa* with instructions to *ryots* to raise their own seed requirements on bunds of fields and on waste lands. The intention of the Association is to make every *ryot* self-sufficient in respect of the supply of green manure seeds. There are 1·2 millions of acres of wet land in this district and these will require atleast 20 million lb. of green manure seed or roughly 1¼ lakhs of bags of seed. Each seed produces not less than 2000 seeds in the course of a season and in two seasons, it is theoretically possible to get 40 lakhs of seed. Five lb. of seed can be theoretically multiplied in the course of two seasons to satisfy all the requirements of the

* An appeal issued on 15th February 1943.

district. The Agricultural Association has distributed free already over 1000 lb. of different kinds of seeds for multiplication purposes alone. If a *ryot* is anxious to raise his green manure seeds and plants on his own lands nothing will stand in his way except his own lethargy and want of initiative. Already over 20 lakhs of *pungam* plants have been planted in the last rainy season along road margins, canal banks, field bunds and on lands which are not put to any use now. The green manure crops raised on the fields and the green manure leaves that can be grown on lands that are left waste now should be more than sufficient to supply the deficiency of nitrogen.

The deficiency of phosphoric acid can also be made good by the *ryot* without any extra expenditure. The chief source of phosphoric acid available for the *ryot* is bone which however, requires to be converted into a suitable form for application uniformly to the lands. Raw bones are hard to break; but if the bones are calcined, they crumble to pieces in the fingers. The *ryot* can easily collect all available bones and have them calcined as follows: The bones are spread between alternate layers of *karukkai* (*shavi* paddy) or *umi* (paddy husk) or other fuel and the whole is covered with a layer of leaves or straw and mud-plastered. A few small holes are made for ventilation before the heap is set on fire. After the fuel is completely burnt, the bones will remain intact consisting mainly of calcium phosphate and they can be easily powdered with a stone if it is done on a small scale and in the mortar mill if required on a larger scale.

The bone loses 40 per cent of its weight during calcination and the remaining bone-ash is richer in phosphoric acid content than bone-meal. Analysis by the Agricultural Chemist at Coimbatore has shown that it consists of 37·8 per cent of phosphoric acid against 23·2 per cent in bone-meal. Bone-ash has no smell and it can be stored in the house. It is less bulky and it costs nothing if the *ryot* converts the bones of his dead cattle into bone-ash with the waste products of paddy cultivation like *karukkai* or *umi* as suggested above.

At present, the bones are collected by a few collecting agencies and converted into bone-meal or super-phosphate with the aid of expensive machinary or chemicals. The *ryot* does not realise that the bones which are sent out of the district in this way are derived from cattle that are fed on the crops raised on his own lands and therefore, there is a continual drain of phosphates which can certainly be prevented if he is careful. The Association therefore appeals to every *ryot* whose lands are deficient in phosphoric acid to arrange to collect all available bones and calcine and powder them and apply the ash to the fields.

With intensive green manuring and bone-manuring, every *ryot* should be able to produce at least 75 *kalams* to an acre and the Association hopes that the *ryots* will stir themselves up and see that their lands produce more paddy at less cost and thereby improve their own material prosperity and the prosperity of the country.

Abstract

Factors affecting the longevity of cottonseed D. M. Simpson (*J. Agri. Res* *64,407—419, 1942*). The longevity of cottonseed is definitely dependent upon the moisture content of the seeds and the temperature conditions under which the seeds are stored. The studies here reported deal with the effects of moisture alone under "normal" storage temperatures and with the combined effects of controlled moisture temperature conditions.

In ordinary storage, seeds quickly reach a moisture content in equilibrium with that of the storage environment. In storage experiments with upland and sea-island cottonseed under the humid and fairly high temperature conditions prevailing near Charleston, S. C., seeds in bags deteriorated rapidly after 2 years,

but seeds with a moisture content reduced below 8 percent and stored in tin containers to prevent the rapid reabsorption of moisture retained their viability with only slight impairment for 7 years, and a few seeds were still germinable after 10 years' storage.

Lots of upland and sea-island cottonseed sealed in glass jars and containing 11 percent moisture were worthless for planting purposes after 2 years' storage, but other lots, especially of the sea-island seed, containing 6 and 8 percent moisture, showed a high percentage of viable seeds after 7½ years' storage. Thus, cottonseed containing less than 8 percent moisture apparently does not require aeration and can be kept viable for many years in airtight containers even at the temperatures that prevail along the Coastal Plain.

Cottonseed of two upland varieties was adjusted to several levels of moisture ranging from 7 to 14 percent and stored at constant temeratures of 90°, 70°, and 33° F. Corresponding checks were subjected to normal fluctuating temperatures at Knoxville, Tenn. The seeds stored at 90° deteriorated rapidly, those containing 14 percent moisture were all dead in 4 months and after 36 months' storage only those seeds with 7 percent moisture were germinable, and their vitality was impaired. In contrast seeds stored at 33°, even with 14 percent moisture, retained their viability for 36 months without appreciable impairment. Seeds stored at air temperature and at 70° were somewhat intermediate with respect to moisture tolerance. The higher moisture lots deteriorated less rapidly at 70° than at air temperature.

If the moisture content is low cotton seeds can withstand high temperatures without rapid deterioration, and if the temperature is kept low they are tolerant of high moisture, but both temperature and moisture cannot be high if rapid deterioration is to be prevented.

In field germination tests, the percentage of seedling mortality was greater from seeds stored at 33°F. than from seeds stored at higher temperatures. Apparently, the low storage temperature was also favourable for the survival of anthracnese spores on the seeds.

Analyses of stored seeds showed that with increased seed moisture or increased storage temperature there was a corresponding increase in the percentage of free fatty acids in the oil. (*Author's Summary*).

Gleanings

Synthetic fibre from soyabean It seems, as it were, that there is no end to the list of uses in which soyabean can be used. Here is the news of a synthetic fibre, similar to sheep's wool, produced from soyabeans, which is coming into use in upholstery in ever increasing quantity. The pioneering lead was given by the Ford Motor Company which now operates a 'pilot' mill capable of spinning more than thousand pounds of synthetic fibre a day. The fibre is spun from a molasses-like substance containing soyabean protein as its chief ingredient. The process involves the extraction of oil from soyabean and the subsequent removal of protein from oil-free meal. Protein, thus extracted, is dissolved to produce a viscous substance which is forced through a spinneret containing 500 holes to emerge in the form of filaments. The filaments are then passed through acid baths and later on immersed in formaldehyde baths to set the fibres. The fibres are cut according to required lengths and subjected to a process of drying under controlled conditions of temperature and humidity. Some other minor operations are necessary before the fibres are finally made ready for spinning. The product is merited with a natural crimp and a high degree of resiliency. The research chemists are of opinion that the synthetic product can

be best used in combination with sheep's wool, and it is in this form that soya-bean fibre is now-a-days used in American upholstery mills. (*Science and Culture, November 1942.*)

Cotton cloth made warmer A simple process has been developed on behalf of the Indian army by an Indian scientist in co-operation with B. S. I. R. for imparting warmth of wool to cotton cloth. The process involves in impregnating cotton cloth with seeds of indegenous trees grown profusely in India. The treated cloth develops thermal qualities compatible with natural wool. (*J. Indian Chem. Soc. Industrial and News Ed; 1942, Vol. 5, No. 4.*)

Milk from virgin goats Under the caption 'Milk from Virgins' the July issue of *Monthly Science News* publishes a note how Dr. S. J. Folley and his colleagues at the National Institute for Research in Dairying at Shinfield have recently succeeded in making virgin goats produce milk and demonstrated the superfluity of the usual process of mating. This somewhat peculiar result is reported to have been achieved by treating virgin animal with diethylstilbaestrol and hexoestrol—synthetic alternatives to sex hormones, first prepared by Prof. E. C. Dodds. The basis of such treatment is the knowledge gained recently through researches that hormones from two glands, the ovaries and the anterior pituitary glands, are mainly responsible for the development of the mammary glands of the animals and the production of milk. It has been found that the hormones from the latter gland are indispensable for starting and maintaining the flow of milk. A definite knowledge as to whether sex hormones act directly on the mammary glands, or simply stimulate the anterior pituitary glands, to generate other hormones which are directly responsible for the development of udders is, however, yet lacking. Dr. Folley has further observed that the quality of milk from cows depends on the strength of the doses of sex hormones or the synthetic preparations administered. Strong doses may even altogether stop the production of milk. Weak doses, on the other hand, have been found to increase the proportion of fat and other solid matter in milk which demonstrates that a proper selection of strength can improve the quality of milk. Further research in this direction is in progress and these new results are destined to be of considerable economic importance. (*Science and Culture, December 1942*).

Research Item

Another use of *Cryptostegia grandiflora* R. Br. for war purpose

Milk-weed (*Asclepias curassavica* L.) is an introduced plant with pretty flowers often found on the bunds of rice lands in Coimbatore District and other places and sometimes grown in gardens. It is a troublesome weed in the United States of America; but the floss from the fruits (follicles) has turned out to be a very important war purpose commodity. It is now used for filling life jackets and in linings of flying suits, instead of Kapok (*Eridodenron pentandrum* Kurz.) formerly imported from Java. It is six times as boyant as cork and is as warm as wool. During the current year 50,000 acres of barren land in Michigan is reported to be put under this plant.

The floss of all plants of *Asclepiadasceae* being similar in nature, the floss of *Cryptostegia grandiflora* R. Bn., the rubber vine would provide yet another article for winning the war.

Madras Herbarium,
Agricultural Research Institute,
Coimbatore, 27—4—'43.

K. Cherian Jacob

Hints for Bee-keepers

For June, 1943

The important pollen sources in the month are maize, *cholam*, *cumbu*, *Lagasca mollis*, guava, coconut, babool, *Euphorbia* and *Poinciana regia*. Tamarind. *Antigonon* and drumstick afford a scanty supply of nectar. In spite of the varied flora in flower very little foraging is done due to the outbreak of the South West monsoon and the consequent windy weather. Brood rearing almost ceases and there is a steady dwindling in the population of the colonies. They have to be looked after carefully to avoid desertion. The supers and superfluous combs in the brood chamber should be removed and stored carefully in an insect-proof receptacle. A dummy division board may be given for weak colonies to maintain the temperature and provide the necessary compactness. Colonies without adequate stock of honey should be artificially fed either with pure dilute honey or sugar syrup once a week. The food may be poured over the frames or given in a cigarette tin. In the latter method the tin should be filled with the food, a piece of cloth tied over its mouth and kept inverted inside the hive. An empty super may be added to accommodate the tin. It is not advisable to feed colonies kept side by side, as the bees from adjacent hives sometimes get excited and begin to rob and fight.

Along with the depreciation in the progress of the colonies the bee enemies get the upper hand. Of these the wax-moth is the most serious. The larvae of this moth infest and devour the combs with the result the bees desert the hive. The pest can be easily kept under check by adopting the following simple hints.

(1) Maintain the colony strong. (2) Keep the hive and its parts scrupulously clean. (3) Remove all superfluous combs and store them carefully. (4) Do not leave any piece of comb exposed. (5) Examine all the crevices, splits and joints of the hive for egg-masses of the wax moth and crush them. (6) Change the hive body once in four or five days to avoid the infestation from egg-masses, which might have been laid in the inaccessible places.

The larvae also attack the stored combs. They can be eliminated by exposing the combs to a mild sun, for about fifteen minutes, the temperature in the open not exceeding 90°—100°F. If there is a suspicion that the eggs have been laid in these combs they can be destroyed by immersing the combs in cold water for about 32 hours. The water may be removed with a honey extractor and the combs dried in the shade and stored carefully.

M. C. Cherian and S. Ramachandran.

Crop and Trade Reports

Statistics—Sugarcane—1942—third or final report The average area under sugarcane in the Madras Province during the five years ending 1940-41 represents 3·0 per cent of the total area under sugarcane in India.

The area planted with sugarcane in 1942 is estimated at 121,970 acres. When compared with the corresponding estimate of 112,110 acres for the previous year and the actual area of 109,527 acres according to the Season and Crop Report, the present estimate reveals an increase of 8·8 per cent and 11·4 per cent respectively. The estimate of the previous year was greater than the actual area by 2·4 per cent.

The present estimate of area exceeds the second forecast by 5,580 acres. The excess occurs mainly in Vizagapatam, Kistna, South Arcot, North Arcot, Trichinopoly and Madura.

The estimated area is the same as that of last year in Kistna, Nellore, Chingleput and South Kanara. A decrease in area is estimated in East Godavari, West Godavari, Guntur, Kurnool, Anantapur and Chittoor and an increase in area in the other districts of the Province, especially in Vizagapatam (+5,060 acres), Bellary (+730 acres), South Arcot (+1,170 acres), Central districts except Chittoor (+6,740 acres), and Madras (+780 acres).

The present estimate includes an area of 12,700 acres under ratoon sugarcane in the districts of Vizagapatam (4,500 acres), West Godavari (550 acres), Kistna (1,450 acres), Bellary (350 acres), South Arcot (660 acres), Chittoor (1,200 acres), Salem (1,300 acres), Coimbatore (1,720 acres), Trichinopoly (300 acres), Tanjore (450 acres) and Malabar (220 acres).

The crop suffered to some extent from insufficient rainfall in parts of the Province. The harvest has commenced. The yield per acre is expected to be normal in Tanjore, Madura, Ramnad and South Kanara and below normal in the other districts. The seasonal factor for the Province as a whole is estimated at 89 per cent of the average as against 92 per cent in the previous year according to the Season and Crop Report. On this basis, the yield is estimated at 3,082,300 tons of cane the gur equivalent of which is 328,230 tons as against 2,836,310 tons of cane with a gur equivalent of 309,280 tons according to the final figures of the previous year. The present estimates reveal an increase of 8·7 per cent in the case of cane and 6·1 per cent in the case of gur as compared with the previous year.

The wholesale price of jaggery per imperial maund of 82$\frac{2}{7}$ lb. (equivalent to 3,200 tolas) as reported from important markets on 30th January 1943 was Rs. 14--13--0 in Cuddalore, Rs. 13--3--0 in Erode, Rs. 12--13--0 in Coimbatore, Rs. 12--2--0 in Mangalore, Rs. 11--8--0 in Salem, Rs. 11-0-0 in Adoni, Rs. 10-15-0 in Chittoor, Rs. 10--9--0 in Trichinopoly, Rs. 10--5--0 in Vellore, Rs. 9--14--0 in Cocanada and Rajahmundry, Rs. 9--7--0 in Bellary, Rs. 9--2--0 in Vizianagram and Rs. 8--4--0 in Vizagapatam. When compared with the prices published in the last report, i. e., those which prevailed on 7th December 1942, these prices reveal a rise of approximately 31 per cent in Coimbatore, 21 per cent in Bellary, 18 per cent in Chittoor, 9 per cent in Trichinopoly and 6 per cent in Vizagapatam and a fall of approximately 20 per cent in Adoni, 8 per cent in Salem and 6 per cent in Cocanada, the prices remaining stationary in Vizianagram, Rajahmundry, Vellore and Mangalore.

Statistics – Gingelly—1942-43—fourth or final report The average of the areas under gingelly in the Madras Province during the five years ending 1940-41 has represented 16·0 per cent of the total area under gingelly in India.

The area sown with gingelly in 1942-43 is estimated at 738,700 acres. When compared with the area of 683,400 acres estimated for the corresponding period of last year, it reveals an increase of about 8·1 per cent. The present estimate reveals an increase of about 6·6 per cent when compared with the finally recorded area of 693,070 acres in 1941-42.

One lakh, forty-six thousand and three hundred acres have been reported as sown since the previous forecast was issued in January as against 147,600 acres during the same period last year. These late sowings were mainly on wet lands in East Godavari, West Godavari, South Arcot, Trichinopoly and the South where gingelly was raised as a second crop after paddy.

The estimated area is the same as that of last year in Guntur, Kurnool and South Kanara. An increase in area is estimated in West Godavari, the Deccan (except Kurnool), Nellore, South Arcot, the Central districts (except Trichinopoly) and the South (except Madura). The increase is marked in Anantapur (+13,800 acres), South Arcot (+19,400 acres), Salem (+16,300 acres) and Tinnevelly

(+18,500 acres). A decrease in area is noticed in the other districts of the Province, especially in Vizagapatam (-15,800 acres).

The yield is estimated to be normal in Salem, Tinnevelly and South Kanara and below the normal in the other districts, especially in Kurnool, Cuddaph and North Arcot (75 per cent in each), Chingleput (70 per cent), Bellary and Chittoor (60 per cent in each) and Anantapur (50 per cent). The condition of the late-sown crop is reported to be generally fair.

The seasonal factor for the Province as a whole works out to 84 per cent of the average as against 89 per cent estimated in the Season and Crop Report of the previous year. On this basis, the total yield works out to 84,400 tons, i. e., the same as that estimated in the Season and Crop Report of the previous year.

The wholesale price of gingelly per imperial maund of 82⅐ lb. as reported from important markets on 10th April 1943 was Rs. 18—13—0 in Trichinopoly, Rs. 18—1—0 in Cocanada, Rs. 17—6—0 in Ellore, Rs. 15—7—0 in Tuticorin, Rs. 15—5—0 in Vizianagram, Rs. 14—15—0 in Tinnevelly, Rs. 14—7—0 in Salem, Rs. 13—14—0 in Rajahmundry, Rs. 13—6—0 in Cuddalore and Rs. 12—9—0 in Vizagapatam. When compared with the prices published in the last report, i. e., those which prevailed on 13th February 1943, these prices reveal a rise of approximately 43 per cent in Trichinopoly, 33 per cent in Cocanada, 32 per cent in Vizianagaram, 30 per cent in Ellore, 16 per cent in Salem and Tuticorin, 11 per cent in Cuddalore and Tinnevelly and 8 per cent in Rajahmundry, the price remaining stationary in Vizagapatam.

Statistics—Groundnut—1943—first report The area sown with summer or irrigated groundnut during the three months (January to March 1943) is estimated at 52,900 acres. When compared with the estimated area of 33,700 acres for the corresponding period of last year, there is an increase of 57 per cent.

The wholesale price of groundnut (shelled) per imperial maund of 82⅐ lb. as reported from important market centres on 10th April 1943 was Rs. 12—14—0 in Nandyal, Rs. 12—13—0 in Vellore and Erode, Rs. 12—11—0 in Adoni, Rs. 12—9—0 in Cuddapah and Tadpatri, Rs 12—5—0 in Guntur and Coimbatore, Rs. 12—1—0 in Vizagapatam, Vizianagram, Cuddalore and Hindupur, Rs. 11—10—0 in Salem, Rs. 10—9—0 in Bellary and Rs. 10—4—0 in Guntakal. When compared with the prices published in the last report, i. e., those which prevailed on 18th January 1943, these prices reveal a rise of approximately 43 per cent in Cuddapah, 42 per cent in Vellore, 39 per cent in Cuddalore, 38 per cent in Guntakal, 36 per cent in Erode, 34 per cent in Nandyal and Vizagapatam, 32 per cent in Guntur, 30 per cent in Vizianagram, 26 per cent in Adoni and Tadpatri, 25 per cent in Salem and Hindupur, 23 per cent in Coimbatore and 18 per cent in Bellary.

Statistics—Cotton—1942-43—fifth or final forecast report. The average area under cotton in the Madras Province during the five years ending 1940—41 represents 9·7 per cent of the total area under cotton in India.

The area under cotton in Madras Province in 1942–43 is estimated at 2,171,800 acres, as against 2,541,400 acres for the corresponding period of last year and 2,127,900 acres according to the forecast report issued in February. The present estimate for the province represents a decrease of 15·0 per cent as compared with the finally recorded area of 2,555,954 acres in 1941–42. The final estimate of last year fell short of the actuals by 0·6 per cent.

The decrease in area in the current year as compared with the area in 1941–42 occurs in all the important cotton growing districts of the Province except Guntur, Kurnool and Trichinopoly. The decrease is marked in Bellary (-105,600 acres), Coimbatore (-74,100 acres), Madura (-51,000 acres) and Tinnevelly (-112,900 acres).

Picking of cotton is in progress and may be finished in about a month.

The crop was affected to some extent by the heavy rains of December 1942 in parts of the districts of Ramnad and Tinnevelly and by drought in the rest of the Province.

The yield per acre is expected to be normal in Salem (irrigated Cambodia cotton only) and below the normal in the other districts of the Province.

The seasonal factor for the Province as a whole works out to 75 per cent of the average for both irrigated and unirrigated cotton, the corresponding figures according to the Season and Crop Report of the previous year being 99 per cent. On this basis, the yield works out to 406,300 bales of 400 lb. lint as against 564,350 bales estimated for the previous year which represents a decrease of 28·0 per cent. It is, however, too early to estimate the yield with accuracy as much will depend on future weather conditions and their effect on the second crop and on the amount of damage done by insect pests.

The average wholesale price of cotton lint per imperial maund of $82\frac{2}{7}$ lb. as reported from important markets on 10th April 1943 was about Rs. 46—1—0 for Cocanadas, Rs. 41—15—0 for white Northerns. Rs. 35—6—0 for red Northerns, Rs. 34—0—0 for Westerns (*mungari*). Rs. 37-3-0 for Westerns (*jowari*), Rs. 85-12-0 for Tirupur Cambodia, Rs. 73—7—0 for Coimbatore *karunganni*, Rs. 65—6—0 for Southern Cambodia, Rs. 58—15—0 for Tinnevellies and Rs. 39—6—0 for *Nadam* cotton. When compared with the prices published in the last report, i. e., those which prevailed on 6th February 1943, these prices reveal a rise of approximately 58 per cent in the case of Coimbatore *Karunganni*, 55 per cent in the case of Cocanadas, 48 per cent in the case of red Northerns, 46 per cent in the case of Tirupur Cambodia, 43 per cent in the case of Westerns (*jowari*), 36 per cent in the case of white Northerns, 18 per cent in the case of Westerns (*mungari*) and 11 per cent in the case of *Nadam* cotton. (*Secretary, Board of Revenue—Civil Supplies, Madras*)

Cotton raw in the Madras Presidency The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February to 30th April 1943, amounted to 112,412 bales of 400 lb. lint as against an estimate of 393,900 bales of the total crop of 1942—43. The receipts in the corresponding period of the previous year were 140,296 bales. 155,027 bales mainly of pressed cotton were received at spinning mills and 639 bales were exported by sea while 56,600 bales were imported by sea mainly from Karachi and Bombay. (*Director of Agriculture, Madras*)

Moffusil News and Notes

Agricultural Exhibition—Guntur District An agricultural exhibition was held at Kotappakonda in Narasaraopet taluk during the *Mahasivaratri* festival from the 2nd to 5th March. Seeds of Departmental strains of crops, Presidency collection of chillies, banana fruit preserves, ploughs and bund former were some of the important exhibits. (A. D. Narasaraopet)

Agricultural Exhibitions—Cuddapah District Agricultural exhibitions were organised at Vontimitta in Sidhout taluk and Pushpagiri in Cuddapah taluk at the time of the car festivals from the 18th to 20th April and 7th to 9th May, respectively. Various improved agricultural implements, models of *Kifayat Rahats* and *Sindhwahs furance*, seeds of high yielding strains of crops and posters on Grow More Food campaign and the several concessions granted by the Government to aid the same were exhibited. Ploughing with iron ploughs, forming bunds with the bund former and levelling with the buck scraper were

demonstrated. Lectures were delivered on Grow More Food and War propaganda. The National War Front organisation also participated in the activities. (D. A. O. Cuddapah)

Agricultural Exhibitions—Ramnad district Agricultural exhibitions were conducted at Tiruchuli in Aruppukottai taluk and Kunnakudi in Tirupattur taluk from 14th to 21st March and 18th to 21st March respectively. Seeds of Departmental strains of crops, labour saving appliances such as iron ploughs and ball bearing mhote wheels and specimen crops of *daincha* and *kolinji* grown in pots were exhibited. Posters on Grow More Food campaign and the concessions granted by Government were displayed prominently. Pamphlets on Grow More Food and other items of agricultural propaganda were distributed free to the visitors. Seeds of vegetables such as tomato, raddish and Bellary onion, cuttings of Jaffna *murangai* and lime squash from Fruit Research Station, Kodur, were sold. The exhibitions were highly appreciated. (D. A. O. Ramnad)

The First West Coast Fruit Show The first of the regional fruit shows for West Coast fruits, fruit products, fruit dishes and recipes was held on the 26th and 27th April at the Government College, Mangalore. The function served to focuss the interest of the people on the important role of fruits in providing a healthy supplementary food to all diets. (D. A. O. Mangalore)

B. Sc. Ag. Degree Examinations 1943

List of successful candidates

First Examination Anjaneyulu, C. V. Audinarayana Reddi, G. Balasubrahmanyan, R. Bettai Gowder, R. Govindarajulu, R. Gulam Muhammad Sheriff. John Chinnayya, E. Kanakachala Rao, K. Krishnan, A. S. Madhava Rao, V. N. Muhammad Azimuddin. Muhammad Madar, A. M. Nageswara Rao, P. Narasimhalu, K. Narasimha Rao, V. V. Narayana Reddi, K. V. Padmanabhan Nambiar, K. P. Raghavan, K. Raghavendra Rao, W. Rajappa Ayyar, P. V. Ramachandrachari, C. Ramakrishna Rao, P. Ramamohana Rao, A. Ramamohana Rao, S. Raman, K. R. Ramanathan, K. Ramanathan, M. Ranga Rao, D. Samuel Sundararaj, J. Satagopan, R. Shanmugham, T. S. Sundaram Pillai, K. Thomas, R. E. Thomas Reddi, A. Venkatachalam, K. Venkataswami, B. Viswanadham, Y. (Agricultural College, Private Study). Bhaskara Rao, K. Kanaka Rao, G. Khaja Sha Habibulla. Ranganathan, R. Venkatanadhachari, G.

Second Examination Ammi Raju, P. Appalanarasayya, K. Chellam Vincent, E. R. Chockalingam, C. D. Dasaradhi, T. B. Ibrahim Ali, S. A. Francis Gurubatham, Krishnamurthi, P. A. Narasimha Doss, T. Narasimham, R. Narasimha Rao, G. Narasimha Sastri, V. L. Narayanaswami, K. R. Nargunam, W. R. Navaneethakrishna, T. V. Padmanabha Pillai, D. Priyavratha Rao, S. B. Raghavan, N. Rajagopalan, K. Ramanjaneyulu, S. Rami Reddi, D. Sankara Reddi, G. H. Somayajulu, P. L. N, Srinivasa Ayyar, P. A. Suryanarayana Sastri, M. Thyagarajan, N. Vasudeva Reddi, C. Venkatarama Reddi, T. Venkataswami, T. Vankatraya Pai, T. Subba Rao, K.

Final Examination Ganesan, K. R. Krishnaswami, S. Kuppuswami, K. P. Kutumba Reddi, K. Narasimha Rao, I. L. Prabhakara Reddi, G. Rajagopal Reddi, V. Thandavarayan, K. Anantakrishna Rao, P. N. Devadas Kamath, V. Dhanavantari Reddi, M. Gopalakrishna Sarma, M. V. Govindaswami, C. V. Krishnamurthi, C. (Ist class). Kuppuswami, B. S. Mirza Anser Baig. Narasimha Reddi, R. Padaki, G. R. Palaniswami, T. V. Ramakrishna Sastri, K. Rama Rao, V. Ramesh Adyanthaya, N. Sridhara Sastri, D. Srinivasan, C. Subrahmanya, R. Sundara Rao Y. R. Suryanarayanamurthi, K. V. S. Tiruvengadam, C. R. Ummerkutti, O. V. Venkataraman, T. M. Venkataraman, C. R.

Anantakrishnan, N. Koulutlayya, M. C. Nageshwar Rao, J. P. Narayanamurthi, R. Radhakrishna Reddi, A. Ramanadhan, S. Ramaratnam, W. S. Ranga Rao, K. Venkataramana Reddi, G.

Departmental Notifications

Gazetted Service—Appointments, Postings and Transfers

Sri Samuel Jobitharaj, D. A. O. is appointed Pulses Specialist with effect from the date of taking charge.

Sri M. Subramania Ayyar, D. A. O. Madura, is appointed to hold full additional charge of the post of D. A. O. Tinnevelly, *vice* Sri T. G. Muthuswami Ayyar permitted to avail leave.

Sri M. U. Vellodi, D. A. O. Coimbatore is appointed to hold full additional charge of post of Deputy Director of Agriculture, Coimbatore, *vice* Sri B. Ramayya granted leave for 21 days from 3—5—43.

Sri B. Ramayya on return from leave to resume the post of Deputy Director of Agriculture, Coimbatore.

Sri U. Vittal Rao, D. A. O. (on leave) to be D. A. O. Mangalore.

Sri K. K. Raghavan, D. A. O. Mangalore to be D. A. O. Tanjore.

Leave

Sri K. Venkatarama Ayyar, D. A. O. Ellore, l. a. p. for 2 months and 15 days from the date of relief.

Sri T. S. Ramasubramania Ayyar, Assistant Agricultural Chemist, Coimbatore, l. a. p. for 1 month from 13—4—43.

Subordinate Service—Postings and Transfers

Name of officer	From	To
Sri M. K. Lingiah	F. M. A. R. S., Koilpatti	A. D. Wheat Rust Control Scheme, Coonoor
„ S. V. Naidu	A. D. Done	A. D. Markapur
„ V. Satagopa Ayyangar	F. M. Central Farm, Coimbatore	A. D. Mayavaram
„ P. Somayajulu	A. D. Salur	F. M. A. R. S. Samalkota
„ G. Ranganathaswami	F. M. A. R. S. Anakapalle	A. D. for Vegetable Nurseries, Vizagapatam District
„ G. Satyanarayana	A. D. Ramachandrapuram	„ „
„ Ch. Venkatachalam	A. D. Tadepalligudam	„ „
„ T. Lakshmipathi Rao	A. D. Bhimavaram	„ „
„ V. K. Kunhunni Nambiar	A. D. (on leave)	A. D. Manantoddy
„ K. V. Natesa Ayyar	A. D. (on leave)	A. D. Gudiyattam
„ K. B. Vaideswara Ayyar	A. D. Gudiyattam	F. M. Kalahasti
„ V. S. Rangacharlu	F. M. Kalahasti	A. D. Saidapet
„ K. S. Mudali	A. D. Orathanad	A. D. Tiruturaipundi
„ L. K. Narayana Ayyar	A. D. Tiruturaipundi	A. D. Papanasam
„ M. K. Swaminathan	A. D. Papanasam	A. D. Orathanad
„ G. C. Balaraj	F. M. A. R. S. Aduturai	F. M. A. R. S. Pattukottai
„ P. Gopalakrishnan	F. M. A. R. S. Pattukottai	F. M. A. R. S. Aduturai
„ A. Ramadoss	F. M. A. R. S. Aduturai	A. D. Arantangi
„ R. Subramania Ayyar	A. D. Arantangi	F. M. A. R. S. Aduturai
„ R. Krishnamoorthy	A. D. Mayavaram	F. M. A. R. S. Pattukottai.

Leave

Name of officer	Period of leave
Sri R. Govindarama Ayyar, F. M. A. R. S. Pattukottai	L. a. p. for 2 months from the date of relief
„ M. Satyanarayana, F. M. A. R. S. Guntur	Extension of l. a. p. on m. c. for 1 month and 3 days from 27—3—43.
„ P. S. Athmarama Ayyar, A. D. Avanashi	L. a. p. for 1 month from 10—5—43.
„ T. V. Srinivasacharlu, A. D. Sriperambudur	Extension of l. a. p. on m. c. for 1 month from 20—5—43.
„ B. Shiva Rao, A. D. Tuni	L. a. p. on m. c. for 2 months from 29—4—43.
„ P. V. Hanumantha Rao, A. D. Virdhachalam	Extension of l. a. p. on m. c. for 3 months from 28—4—43.
„ T. Gopalan Nair, Asst. Fruits Section (on leave)	Extension of l. a. p. on m. c. for 7 weeks from 1—4—43.
„ M. P. Gowrisankara Ayyar, A. D. Devakottai	L. a. p. for 2 months from 21—4—43.
„ M. Srinivasa Rao, A. D. Kavali	L. a. p. for 30 days from the date of relief.
„ M. Kandaswami, Asst. Tobacco Res. Scheme, Guntur	L. a. p. for 1 month from 3—5—43.
„ K. S. Ramana Rai, A. D. Hospet	Extension of l. a. p. for 1 month from 23—4—43.
„ B. G. Narayana Menon, F. M. Nileswar	L. a. p. for 62 days from 26—4—43.
„ K. M. Jacob, A. D. Manantoddy	L. a. p. for 3 months and 29 days from 1—5—43, preparatory to retirement.
„ M. Subba Reddy, A. D. Venkatagiri	Leave on half average pay on m. c. for 60 days from 17—5—43.

OBITUARY

We regret to learn and to announce the following deaths.

A. Chinnathambi Pillai, retired Assistant Director of Agriculture expired on the 9th May 1943 at Koomapatty, Ramnad district.

V. Karunakaran Nair, Agricultural Demonstrator, Sivaganga, expired on the 8th May, 1943, at Parappanangadi, S. Malabar.

We extend our sympathies to the members of the bereaved families.

The Madras Agricultural Journal

(ORGAN OF THE M. A. S. UNION)

Vol. XXXI JUNE 1943 No. 6.

EDITORIAL

The Food Policy The recently concluded United Nations Conference on Food and Agriculture held at Hot Springs, Virginia U. S. A., made a declaration to the effect that a child or adult should get the nourishment necessary for full health and that the primary responsibility lies with each nation for seeing that its own people have the food needed for health and life. This leaves no room for any country to take a light view of the food situation that is confronting the Allied Nations at present. In his address to the delegates to the above conference, President Roosevelt, while accepting the above declaration on behalf of the United States, drew pointed attention to the importance of the problem both during war and peace time and called for a sound agricultural programme for the future. The matter becomes all the more important when it is realised that no nation ever had enough food to feed all its people as we now know how human beings should be fed. According to statistics, India grows but 25 million tons of rice as against 27 million tons she consumes and 10 million tons of wheat as against 9½ million tons required by her. In the matter of *cumbu, cholam* and *ragi* which are the other food grains largely consumed, India is said to be self sufficient, while she is not producing enough of her requirements in pulses. To meet this deficit and to supply the needs of some of the adjoining territories that have become a liability on her due to this global war, a Grow More Food campaign was inaugurated in India. The movement has since gained momentum and it is claimed that larger areas have been brought under arable farming and that production has been substantially increased. The various Provincial and State Governments have to their credit enactments of auxillary and ameliorative measures, such as rent-free assignment of lands, granting of concessions to cultivators, providing extra irrigation facilities, distribution of manures and seeds etc. Yet, with all these efforts we are told that there is shortage of food stuffs in many localities and that especially the poor class of people are left without adequate food supplies. Various causes are attributed to this situation of which hoarding, reluctance to release stocks by producers and merchants and the existence of black markets are said to be the most important. While we agree with this view and appreciate the sincere efforts of the Government to ease the situation, we urge that the production issue is faced more squarely. An unbiassed and critical review of the achievement of the Grow More Food campaign during the last two years would, we believe, bring out

clearly what further action should be taken to step up production of each of the essential commodities. It is for consideration whether the extension of cultivation, especially to the derelict land has diffused labour, work cattle, implements and fertilizers from lands under normal cultivation and thereby reduced the outturn from such lands. In the enthusiasm for extending the area under food crops we should not loose sight of this aspect. Every effort should be made to keep up or raise the level of yields from lands already under staple food crops by assuring adequate facilities for irrigation, manuring and labour supply. If necessary, special staff should be employed in particular tracts to do intensive propaganda on improved methods of cultivation. Experiments on District Farms have shown that growing a green manure crop or applying oil cake, using seeds of improved strains, thin-sowing of nurseries and close planting enhance the yield of paddy by 20 to 30 percent. If all the paddy tracts of this Province adopted these improved methods, probably the deficit in the supply of rice may be made good to a large extent. Now that we have passed through the preliminary and pioneering stages in the Grow More Food campaign, it is very desirable that a long-range view of the whole problem is taken by the Government and a definite policy laid down as the scope for planned agriculture is immense in this country. In previous issues of this Journal, we have suggested the encouragement of local production of artificial and organic manures, insecticides and fungicides, and for the provision of warehouses for storing produce free from the depradation of vermins—factors which have a direct bearing on increased production. We also suggest that greater attention may be paid to the encouragement of animal husbandry and dairying, including goat and poultry breeding, and development of inland fisheries and intensive sea fishing. Such a step would provide the nation with a variety of food stuffs and a nourishing diet which will keep up the vitality of its people and make them work effectively and efficiently in the defence of the country. We hope that the matter will receive the attention of the authorities concerned and that we will soon have long-range policies formulated in the matter of food production so that all people, rich and poor alike, are assured of the supply of adequate quantities of proper food at reasonable prices.

Birthday Honours . Among the recipients of the Birthday Honours we are glad to find the names of Mr. P. M. Kareghat, I. C. S., who has been knighted and Mr. A. R. C. Westlake, I. C. S., who has been made Companion of the Indian Empire. Mr. Kareghat has long been connected with agricultural development in this country as the Vice-Chairman of the Imperial Council of Agricultural Research. Mr. Westlake, who is the Secretary to the Government of Madras in the Development Department was for sometime Director of Agriculture in this Province and was responsible for reorganising and strengthening the propaganda wing of the Department. He took a special interest in the activities of the Madras Agricultural Students' Union and this Journal. We offer our hearty felicitations to these distinguished civilians.

Studies on Soybeans in Sind

By K. I. THADANI, M. Ag., M. Sc.,

Director of Agriculture, Sind

AND

R. T. MIRCHANDANI, B. Ag.,

Agriculturist, Agricultural Research Station, Dokri

Introduction The Soybean, *Glycine max* L. is a native of Eastern Asia. The culture and use of the Soybean are recorded in the ancient Chinese literature and undoubtedly date from a period long before the time of written documents. It is the most important legume in China where it is one of the most essential articles of food.

There is sufficient evidence to show that soybean has also been cultivated in Northern India and Burma since a long time. Major T. E. T. Aitchison (1881) found the soybean largely cultivated in the Kuram valley, North-west Frontier Province, especially in the Kuram district, occasionally in Hariab and also frequently as a weed in the cultivated fields. Hooper (1911) in his investigations on soybeans has recorded seeds aggregating perhaps into nine distinct varieties, collected from Burma and from places situated on the lower slopes of the Himalayas extending from Kashmir to Darjeeling. Woodhouse and Taylar (1913) describe nine Indian varieties secured from Darjeeling, Bankipur and Bhagalpur. Most of the Indian varieties have slender twining stems, small pods and small seeds. They resemble the wild soybeans much more closely than do the varieties of China and Japan. The existence of different local names for soybeans in Bengal, Assam, Nepal and the North-west Frontier Provinces is also an evidence of its ancient culture in India.

With the opening of the Lloyd Barrage in Sind, investigations into the possibilities of cultivation of soybean in Sind under the perennial irrigation system, were started at the Agricultural Research Station, Sakrand, in the year 1929; but all attempts failed until 1931 when for the first time a successful crop was grown for seed. Several varieties of soybeans obtained from abroad and from various provinces of India have been tested. The small seeded and late-maturing varieties have succeeded fairly well under the Sind conditions. It has been found difficult to establish foreign big-seeded varieties as their germination when sown in beds is very low and besides they are subject to white ant attack which does the most damage.

Cultivation method Soybean has been found to succeed on a variety of soils varying from sandy loam to loamy soils. The crop is rather sensitive to *Kalar* (alkali soils) and cannot be grown in stiff soils. In the United States of America, artificial inoculation of the land that has not previously grown soybean has been found necessary, while under the Sind conditions

the inoculation of land has not been found to result in any extra advantage. The last fortnight of June has been found to be the suitable time of sowing as nothing is gained by sowing the crop earlier. The crop whether sown early or late matures at the same time, *i. e.* in December. A spacing of 3 to 4 ft. between rows and 6 to 9 in. between plants has been found to give high yields. When the crop is grown for fodder purpose, the distance between the rows should be $1\frac{1}{2}$ to 2 ft. Under the Sind conditions, an average yield of 825 lb. of seed per acre has been obtained. The soybean crop was grown for fodder and it yielded on an average 10,300 lb. of green fodder in a single cutting, and did not give further cuttings. The yield of fodder when compared to that of *Jowar (Andropogon sorghum)* which yields about 20,500 lb. in one cutting, is very poor.

Description of varieties tested Twenty one varieties of soybeans obtained from different provinces of India and the foreign countries, viz. U. S. A. United Kingdom and South Africa have been tried at Sakrand. These varieties for the sake of convenience have been classed into two groups, Indian (obtained from different provinces of India) and exotic, as they form two distinct groups. The Indian varieties have small seeds with oil content varying from 13 to 16 percent while the exotic varieties have big seeds with oil content varying from 16 to 21 percent. The word Indian does not necessarily imply that the origin of the varieties which fall in this group is in India. The history of these varieties is not known and some of these viz. Behrum and Mir-John-Hat which resemble foreign varieties in their habit of growth may have been originally imported from abroad.

(i) **Indian varieties** The following eight Indian varieties, the first six of which have a spreading habit of growth and the last two with bunch habit, have been tried at Sakrand.

Variety	Source from where obtained	Variety	Source from where obtained
Spreading types			
1. Pusa Yellow	Pusa	5. Burma Yellow	Rangoon
2. Pusa Chocolate	,,	6. Pengype	Madras
		Bunch types	
3. Pusa Black	,,	7. Behrum	do.
4. Punjab Yellow	Punjab	8. Mir-John-Hat	Ranchi

(a) *Spreading varieties* The basal portion of the stem is stout and upright and the other portion weak; the branches specially the elongated terminals are more or less twining and are usually weak. The leaves are trifoliate and the leaflets are ovate lanceolate in shape and pale green in colour. The stem, leaves and pods are pubescent and the pubescene is found in two colours, whitish (termed as grey by Piper and Morse) and light fawn to tawny. All the varieties grown at Sakrand have purple flowers. The pods form in clusters of 2 to 3, and on account of long internodes, they appear scattered. These are small in size and have 2 to 3

seeds. Three seed colours, greenish yellow, chocolate and black were noted among the varieties tested. These varieties take 180 to 190 days, to ripen when sown in June.

(b) *Erect varieties* There are only two Indian varieties, viz. Mir-John-Hat and Behrum which come under this class. The stem of these is stout, upright and branching. The leaflets are ovate and big and they vary in number from 3 to 5 per leaf. The stem and leaves have dirty white (termed as greyish by Piper and Morse) pubescence. The flowers are purple and slightly bigger than those of the spreading varieties. The pods are formed in clusters of 3 to 5 and are slightly bigger, and the seeds slightly heavier than those of the spreading varieties described above. The ripening period of these beans is about 160 days when sown in June.

(ii) **Foreign varieties** Thirteen samples of soybeans, listed below, were obtained from abroad and tried at Sakrand.

1. Shangai	2. Larido	3. Chinese White
4. Dalny	5. Vilamskot	6. White Morse
7. Mommoth Yellow	8. A. K. White	9. Haberlandt
10. Barchet	11. Otootan	12. South African Brown
13. American Eye brow		

The habit of growth of all the varieties, except Barchet and Otootan, is erect and branching with a well defined main stem. In Barchet and Otootan varieties, the plants are slender and bushy and have a tendency to lodge. In erect as well as slender varieties, the leaves are trifoliate and the leaflets are usually ovate lanceolate in shape. All the varieties are pubescent. The erect types have the habit of fruiting in clusters while the slender types have the pods scattered. The pods are also pubescent and the pubescence occurs in two colours, light fawn and dirty white. All the varieties, except American Eye brow, have unicoloured seeds of straw yellow, black or brown. The American Eye brow variety has black seeds with brown saddle. The maturity period of these foreign varieties varies from 90 to 155 days. Almost all the imported varieties have well developed big seeds except Barchet and Otootan varieties which have comparatively smaller seeds.

Acclimatization The foreign varieties gave very poor germination in the first year. The stand and the growth of the crop were not satisfactory. The small seeded varieties, viz. Barchet and Otootan, had better germination and stand and seemed to be hardier types than the others. The seed obtained from the foreign varieties with straw yellow colour was smaller in size than the originally imported seed. In most of the plants, the seed was shrivelled. All the varieties were subject to white ant attack. The following statement shows the incidence of white ant attack, the percentage of plants with plump seed and the acclimatizing capacity of the different varieties.

Variety	No of plants soon after germination	Mortality		Final stand		Plants with plump seeds % (P)	Acclimatizing capacity seeds of variety (F × P)/100
		No. of plants	Percent	No. of plants	% (F)		
Yellow coloured seeds							
Shangai	805	606	75	199	25	23·2	5·8
Chinese White	155	121	78	34	22	82·3	18·1
Haberlandt	191	46	24	145	76	61·5	46·74
A. K. White	396	164	41	232	59	38 0	22·42
Mammoth Yellow	212	130	62	82	38	30 5	11·59
Other seeds							
Otootan (black)	291	160	55	131	45	100 0	45 00
Barchet (brown)	289	183	37	106	63	100·0	63 00
South African Brown	172	60	35	112	65	89·3	58·04

It will be seen from the above table that the black and brown seeded types are comparatively hardier and have better acclimatizing capacity than the yellow seeded types. Among the yellow seeded varieties Haberlandt has behaved comparatively better.

Maturity The observations made by Woodhouse and Taylor (1913) at Sabour, India, show that newly imported American varieties take a considerably shorter time to mature at Sabour than in America, but the plants from acclimatized seed mature somewhat later than those from freshly imported seed. Our observations recorded at Sakrand confirm the first statement of Woodhouse and Taylor, *i. e.*, the plants raised from the newly imported seed take considerably shorter period to flower and mature than that taken in the original home. The observations do not corroborate the second statement of the above authors. The data obtained here shows that in the subsequent years, the flowering and the maturity period has not been necessarily greater than that of the first year and in certain cases the period is even shorter. Probably the variation in flowering and maturity period is due to season and varieties. In almost all the varieties, the time taken to flower and to mature in different years is never more than that taken in their original home. A statement of the observations recorded at Sakrand is given in the following table. These varieties were sown in the beginning of June in all the years.

Variety	Days taken to flower					Days taken to mature				
	In U. S. A.°	At Sakrand				In U. S. A.°	At Sakrand			
		1933–34 Freshly imported seed	1934–35 Acclimatized seed	1935–36 Acclimatized seed	1936–37 Acclimatized seed		1933–34 Freshly imported seed	1934–35 Acclimatized seed	1935–36 Acclimatized seed	1936–37 Acclimatized seed
A. K. White	50—55	40	37	49	50	110	101	110	120	112
Haberlandt	50—55	45	40	47	46	125	103	101	121	108
Mammoth Yellow	85—90	55	52	63	54	145	138	126	125	128
Otootan	90—95	65	92	78	90	170	151	155	148	142
Barchet	80—85	65	87	79	89	160	151	155	144	139
Morse White	50—55	40	51	40	...	130	100	115	108	...
American Eye brow	35—40	40	...	...	...	110	98	...	...	...
Larido	75—80	50	...	...	...	140	127	...	...	...

° Data from Piper and Morse (1923).

Natural cross pollination Piper and Morse (1923) conclude from the observations at the Arlington Experiment Station that even when the test rows of several varieties are grown side by side, the percentage of hybrids is perhaps not one individual in two hundreds. They also find that the hybrid seeds can be recognised by the presence of peculiar markings on the seed. Heterozygous plants can be distinguished by the appearance of the pods at the top of the branches; such pods are more tumid, less hairy and of thinner texture. Woodhouse and Taylor (1913) conclude from the observations made at Sabour that natural crosses do not occur on the plains of India to such an extent as in America, and that the crossing occurs more frequently in the more temperate climate of America and the Darjeeling Himalayas.

At the Agricultural Research Station, Sakrand, Indian varieties of yellow, black and chocolate seeds were grown in consecutive rows in the first year. In the year 1932, a few plants (3 plants in a bed with a population of about 500 plants) were found in Pusa yellow variety which had oddly coloured seeds such as smoky yellow and yellow with brown bands. The number of such plants compared with total number of plants was very small. The seeds were grown separately next year and were found to segregate into pure yellow and other shades of yellow which were similar to a natural hybrid.

The foreign varieties tried at Sakrand, were impure in flower character and consisted of both white and purple flowers. Thirty-six single plants with white and purple flowers were selected from three varieties, viz. (1) Haberlandt, (2) A. K. White and (3) Mammoth Yellow and sown during the year 1934—35. Out of these 36 single plant cultures, 30 (13 white flowered and 17 purple flowered) bred true, while six (all purple flowered), showed segregation. During the next season, *i. e.* 1935—36, further selection of single plants was made from the cultures which had bred true to type. In all, 29 single plants were selected which were outwardly pure for flower character. The behaviour of these single plants is shown in the following table.

Variety	No. of single plants selected and sown in 1935-36			Behaviour of the selected plants				
				No. of cultures which bred true		No. of cultures which showed segregation		Total
	White flower	purple flower	Total	For white flower	For purple flower	White flower	Purple flower	
Haberlandt	7	2	9	5	—	2	2	9
A. K. White	8	2	10	8	—	—	2	10
Mammoth Yellow	—	10	10	—	10	—	—	10
	15	14	29	13	10	2	4	29

It was seen that out of 29 cultures which were pure for flower character, 23 bred true and 6 showed variation. These results clearly show that the exotic types are more subject to natural cross pollination than the Indian varieties.

Genetic behaviour of the flower colour Piper and Morse (1923) found that the mode of inheritance of flower colour is in accordance with the simple Mendelian type and that the purple colour of the flower is dominant over white colour. Woodworth (1923) reported that the purple colour was dominant to white and segregated in the F_2 in a 3:1 ratio. At Sakrand, segregations in the progenies of natural crosses found in the pure strains which were isolated from foreign varieties were recorded. The number of plants under observation was less as there was considerable mortality due to white ant attack. The goodness of fit has been worked out.

Variety & strain no.	Character of flower	F_1 phenotype obtained by natural crossing	Segregations in F_2		Goodness of fit
			Purple	White	
A. K. White—86	Purple	Purple	40	11	$\frac{1{\cdot}75}{2{\cdot}08}=0{\cdot}84$
Haberlandt—15	Purple	Purple	21	4	$\frac{2{\cdot}25}{1{\cdot}46}=1{\cdot}54$
		Total	61	15	
		Expected on 3 : 1	57	19	$\frac{4}{2{\cdot}53}=1{\cdot}57$

In the F_3 the following segregations were observed.

No. of cultures	Nature of parent	Behaviour of progeny	Frequency	
			Observed	Expected
4	Purple flower	Pure	1	1·5
		Segregating	3	3·0
2	White flower	Pure	2	1·5

In F_3 the phenotypes segregated as under :—

Phenotype like F_2	Purple	White
1	5	3
2	44	11
3	11	7
Total observed	60	21
Expected on 3 : 1	60·75	20·25

$\frac{\text{Dev.}}{\text{P. E.}}=\frac{0{\cdot}75}{2{\cdot}63}={\cdot}29$ The fit is good.

The behaviour of F_3 confirms the mode of single factor inheritance of flower character.

Acknowledgements The authors' thanks are due to Messrs K. Ramiah, Indore and C. M. John, Coimbatore, for carefully going through the manuscript and giving their valuable suggestions.

References.

1. Du Toit F. M. (1932) *Dept. Agric. Union S. Africa Bull. 107.*
2. Ferree C. J. (1929) *The Soy Beans and the New Soya Flour. William Limited, London.*
3. Hawkins L. A. *Soya bean a valuable legume crop. International Harvester Company Agric. Extension Dept. Chicago U. S. A.*
4. Hayes, H. K. and Garber R. G. (1927) *Breeding crop plants. McGraw Hill Book Company, N. Y.*
5. Hooper, D. (1911) *Glycine hispida (Soy bean), Agric. Ledger No. 3* (original not seen.)
6. Morse W. J. (1927) *U. S. Dept. of Agric. Farmers Bull. 1520.*
7. Piper, C. V. and Morse, W. J. (1923) *The Soy bean. McGraw Hill Book Company N. Y.*
8. Woodhouse E. J. and Taylor C. S. (1913) *India Dept. Agric. Mem. Bot. 5 (3)*
9. Woodworth, C. M. (1923) (Original not seen) Quoted from Hayes and Garber, p. 210 (loc. cit).

Sorghum Grain for Food

By M. A. SANKARA AYYAR, B. A., B. Sc. (Ag.),

Agricultural Research Institute, Coimbatore

Sorghum (*Cholam, Jola* or *Jonna*) is the second important grain crop in the Madras Presidency. It is grown annually on an area of about five million acres in this Province and on about 36 million acres in India. The sorghum grain is the main article of food of the rural population in the dry areas. It is used extensively as human food in Africa, Asia Minor and China also. It is the chief diet of the natives in Africa. It is reported that sorghum grain is the most important source of flour in Egypt and is used in bread-making mixed with wheat, barley and fenugreek or beans.

Now that there is scarcity of rice in many parts of the Province and the people have to manage with available substitutes an attempt is made in this brief note to indicate the common methods of utilizing sorghum. There may be slight variations or modifications in the different processes involved in preparing the same or similar product in different localities. The object of this note is only to present an idea of how sorghum can be prepared for food.

The Sorghum grain is a naked grain. That is, the grain obtained on threshing the earheads and which is sold in the market has no protective covering of husk as in rice. Threshing separates the grain from the husk. The colour of the grain may be white, yellow, red or rarely brown. The colour is confined only to a thin outer layer of the grain which is the seed coat. In all the grains the inner portion, called the endosperm, is white.

In food value the sorghum grain is superior to rice though only second to wheat. It is richer than rice in protein content and richer than wheat and infinitely richer than rice in fat content. The protein content of sorghum grain varies from 8 to 12 per cent and the fat (oil) content from 1·5 to 5 per cent in the different South Indian varieties. The analyses of samples of

sorghum, rice and wheat, according to Dr. Aykroyd (*Government of India. Health Bulletin No. 23, 1937)*, are given in the following table.

	Moisture	Protein	Fat	Mineral matter[1]	Fibre	Carbohydrate
Sorghum	11·88	10·42	1·93	1·76	...	73·99
Rice (raw, milled)	12·96	6·85	0·55	0·50	...	79·14
Wheat (whole)	12·77	11·77	1·45	1·49	1·20	71·30

For most of the preparations, except when the dry grain is converted into flour, the outer seed coat or bran is removed by pounding it lightly in a wooden mortar moistening the grain slightly by sprinkling water. The pounded grain is winnowed and washed with water. The amount of material lost in this process varies from 10 to 25 per cent depending upon the variety.

Annam or Cooked grain The grain after removal of the bran is washed and cooked as it is or after breaking it into small bits in a stone mill. About twice the quantity of water is used for cooking. This is similar to cooked rice and consumed with curry and butter milk. To make *pongal* a small proportion of greengram *dhal* is mixed with the grain and then cooked.

Sankatti, Mudda or Kali The grain after removal of the bran is dried and ground into coarse powder in a stone mill. The finer portions of the powder are sieved out. The coarse powder thus obtained is cooked with about three times its quantity of water. When the whole matter is cooked to the consistency of paste, the finer portion of the powder is also added, and mixed well and cooked. A thick pasty product thus obtained is rolled into balls and eaten. This is considered to be more easily digested than the *annam*.

Kanji or Kulu The process of making this is the same as that for *sankatti*, except that a higher proportion (5 : 1) of water is added, so that the cooked matter is in a more liquid state.

Rotti This is the most common preparation of sorghum in the Bellary district and the adjoining Deccan tract which is the main sorghum area in India. The whole grain is ground into fine flour and sieved to remove coarse particles or bits of seed coat. The fine flour is made into dough by adding water preferably hot water. The dough is kneaded well and is divided into small balls of the size of a tennis ball. The balls are spread out by hand to form circular discs of about quarter of an inch or less thickness and eight to ten inches in diameter. This is baked on a hot pan. A small quantity of wheat or blackgram flour and a few pinches of salt may be added to improve the quality of the sorghum flour and the taste of the product. *Rotti* is sometimes preserved for use for about a week.

Dosai or Pan cake The fine flour obtained by grinding the whole grain is used for this, or the whole grain or the grain after removing the bran is soaked in water and ground into a paste. Sorghum alone or

sorghum and rice is ground first and a small quantity of similarly prepared paste of black gram is added. Salt, chillies and onions are added according to taste; butter milk may also be added. The paste is made into *dosai* by baking on a hot pan on which oil is smeared. Sorghum mixed with red gram and black gram *dhal* may be soaked in water, ground into thick coarse paste and made into another kind of pan cake known as *adai* also.

Pops Another common or easy preparation of sorghum is the pop (*pori* or *pelalu*). All sorghums do not pop well. The grain of the variety known as *Konda jonna* in the Northern districts and *Alangara cholam, Vensamarai cholam* or *Talaivirichan cholam* in the Central and Southern districts is the best for popping. The grain of this variety pops better than that of others. When small quantities (a handful at a time) of dry grain is put on a hot pan or pot and stirred, the grains 'pop'. The pops are taken off the pan or pot immediately. The pops can be made into balls mixed with jaggery and preserved for use. The pops as such or pounded can also be used mixed with milk and sugar, or butter milk, salt and chillies.

Other preparations which are not widely known but common in some places are *kudumulu* or *hidlee*—for which the sorghum flour is mixed with cowpea or Bengalgram and condiments, converted to paste, made into balls or thick flat cakes and cooked in steam; *chakkadam*—for which the flour is moistened with boiling water, salt added, made into small balls, cooked in steam, the cooked balls pressed in a hand press with perforated socket and the pressed stuff fried in oil; and *burelu*—for which the sorghum flour is mixed with jaggery, moistened with water, made into small balls and fried in oil. These show that sorghum can be substituted for rice to prepare many products for every day cunsumption.

A Trial with Cocanada Cottons

By K. SANKARAIAH,

Thumadu, Kandukur Taluk, Nellore District

Since there had been a good market for the short staple cotton of white and red mixture and there had been increasing demand for pure red cotton I had to replace the local variety by a suitable one. For this purpose I conducted a trial in 1941-42 with the following varieties: (i) local (Kandukur), (ii) Kanigiri (Nellore district) (iii) Ambapuram (Guntur district) and (iv) X-20—a 'Cocanada' strain of the Madras Agricultural Department. All these varieties are classed as 'Cocanadas' by the trade.

The trial was conducted in black soil of medium fertility. A rectangular block of the field was divided into seven plots and the different varieties were sown in these in the following arrangement: Plot 1—local, plot 2—X-20, plot 3—local, plot 4—Kanigiri, plot 5—local, plot 6—Ambapuram and plot 7—local. Each plot contained 8 rows of plants 165 ft. long and

5 ft. apart, of which the produce of 6 middle lines of each plot was harvested separately for comparing yields. One line of redgram was sown to demarcate the boundaries between plots.

Cotton is not grown in this tract as a pure crop. It is grown mixed with a millet, like *ragi* (*Eleusine coracana)* or *arika (Paspalum scrobiculatum)* and pulses. About one-sixteenth by measure of pluse seeds are mixed with the millet seed. Following the local practice cotton was sown as a mixed crop with *ragi.* The crop was sown on the 4th September 1941. Ten days after sowing, gaps were filled by sowing fresh seed and crowded plants were thinned out to a spacing of 4 in. between plants.

The harvest of cotton was commenced on the 11th March 1942. Each plot was marked out by four pegs at the corners and a rope tied all round excluding the two outer rows and 5 ft. of every row at either end. The weight of kapas from each plot was weighed soon after harvest. The record of yields of the different plots are presented in the following table :—

Date of harvest	Weight of Kapas in lb.						
	Plot 1 Local	Plot 2 X-20	Plot 3 Local	Plot 4 Kanigiri	Plot 5 Local	Plot 6 Ambapuram	Plot 7 Local
11—3—1942	19	31	16	13	10	14	20
22--3—1942	5	6	16	8	5	4	5
3—4—1942	2	1	4	4	6	4	4
23--4—1942	1·5	2	2·5	1·5	2·5	1·5	1
Total	27·5	40	38·5	26·5	22·5	23·5	30

The area of each plot is $\frac{1}{16}$ acre. When the yields of the three new varieties were compared with those of the 'local' on either side, it was observed that X-20 yielded 21 percent more and Kanigiri and Ambapuram yielded 13 and 11 percent respectively less than the local. Hence X-20 was the best. Another factor in favour of X-20 was the proportion of lint to kapas. The ginning percentage of X-20 was 30 whereas the other varieties gave only 25 percent of lint.

When the money value was considered it was noted that the offer for the 'local' was Rs. 20 per candy of 500 lb. of kapas and for the X-20 kapas Rs. 25 per candy. On lint basis, the offers were Rs. 80 and 100 per candy for 'local' and X-20 respectively. The cost of seed was not taken into account as the seed is given towards ginning wages which is the local practice.

The merchants fix the price of kapas based on the assumption that the ratio of lint to kapas is 1:4. Since the proportion of lint in X-20 is greater than in the local cotton, selling as lint is more profitable. So I got the kapas ginned and sold the lint; and the seed which was given as wages for ginning was purchased for cash for feeding cattle.

While the local cotton spins to 12 to 15 counts, X-20 spins to 20 counts, as certified by the Manager, All India Spinners Association, Andhra branch, Kandukur. After a test he opined that X-20 was very satisfactory and was in no way inferior to Kanigiri red cotton which he had been mainly purchasing for his business, and that its cultivation may be extended and would find a ready market with him.

It is obvious from the particulars furnished above that X-20 cotton, a strain evolved by the Madras Agricultural Department is a better yielder, fetching an enhanced price of Rs. 10-13-0 per acre more than the local variety in Kandukur taluk (Nellore district). The harvest of X-20 can be completed earlier than the local by about a fortnight, as it is early flowering and maturing. Saving of watchman's wages for a fortnight is an additional profit. Since X-20 is a red cotton, unlike the local variety which is a mixture of white and red, it has a better market.

Under these circumstances I may say that the public funds utilised for cotton research has been spent fruitfully to the advantage of the cultivator and it is left to my co-cultivators to make the best use of the fruits of research.

SELECTED ARTICLE

Cultivation as an aid to Soil Fertility

By E. BATCHELOR, *Sherborne, Dorset*

Geological and astronomical authorities place the age of our world at somewhere between two and three thousand million years, and that of the consolidation of its crust at about two thousand million years. Since then the agents of disintegration and denudation—water, atmosphere, heat, cold, and frost and for some hundreds of millions of years, the roots of vegetation, together with rabbits, moles and earthworms—have, mainly through the solvent action of rain water, transformed the solid rock into sand and clay and transported these products, together with minerals in solution, into the rivers, seas and oceans. The geological formations resulting therefrom after being raised above sea level, have repeatedly been subjected to the same processes of disintegration and denudation.

Observation in a railway cutting or quarry will frequently show slightly disintegrated rock at a depth of only a few feet below the surface. Above this the rock can be seen to be in progressive stages of disintegration until, at the surface, the solid formation has been transformed into fine sand or clay and is ready for erosion by rain and surface flow into adjoining streams. What is now soil on the land surface was but a short time ago, as measured by the geological clock, solid rock some feet below the surface. The rates of disintegration and denudation are clearly interdependent and vary with climatic conditions.

The use of tillage implements accelerates the rate of disintegration and denudation.

Soil fertility enhanced by tillage The mineral constituents of a plant are taken up in solution in water, but their solubility varies greatly; for example, that of silica is very much less than that of calcium. In this country disintegration is effected mainly by solution in the surface flow of water and by solution in the rain water sinking into the soil to the ground-water. The solvent power

of rain water, over that of pure water, is due to the presence of carbonic, nitric and sulphuric acids, absorbed from the atmosphere. As rain water dissolves the mineral constituents of a solid mass of unweathered rock, or of the soil derived therefrom, a part of the mineral solutes is removed by surface and ground-water flow and is lost as plant food in the vicinity of that rock or soil. Part is re-precipitated elsewhere in the rock or soil. During intervals between rainfalls, water, impelled by the pressure of surface tension (capillarity), rises to the surface of the soil and evaporates leaving deposits of minerals in the surface soil. As each particle of mineral is dissolved, the surface area of the parent rock or soil exposed to the action of water becomes larger, and the mineral content of the water in a cubic foot of rock or soil thereby increases. The rate of solution of a mineral when re-precipitated from water moving in the soil, or when deposited by the evaporation of the water containing it, is greater, often far greater, than when the mineral is first exposed to the solvent action of water on the surface of the unweathered rock. *It follows, therefore, that the rate of mineral solution, and hence the fertility of a soil, is enhanced by exposure to the action of atmosphere and rain.* This is true even if the surface is untilled; by tillage the rate is increased. When, for example, land is bare or summer-fallowed, and there are no plants to assimilate the minerals precipitated in the soil by the process of disintegration described above, considerable quantities of these minerals are accumulated, and the land is described as 'regaining fertility'. The ensuing crop will then be larger than if the soil had been continuously cropped; but the fact that continuous cropping results in a smaller yield is no justification for regarding the soil as 'exhausted'.

Manuring: *Green manuring* When green manuring, particularly with legumes, is practised, some part of the elements essential to the following crop, especially nitrogen, are fixed in the plant and are not eroded as they might be were the land bare fallowed. The ploughing up of old pasture land may be regarded as a kind of green manuring. It is frequently asserted that the keeping of land under grass is a method of building up a reserve of fertility, and that the humus so obtained is indispensable for the maintenance of fertility. However, no satisfactory definition of what is meant by 'humus' has yet been framed; nor has the writer seen any estimation, in numbers, of this 'reserve', nor of the stores of so-called 'humus'. The presence of plant roots and the ploughing in of stalks improves the texture of some soils until the roots and stalks are disintegrated and the soil settles down; *drainage and aeration may be improved through their presence.* These effects will increase fertility without the supply of minerals.

Animal manuring The value of urine and dung for improving vegetation was obvious to primitive man. Elements present in organic form in animal excreta have to be retransformed into an inorganic form before they can be dissolved in water and assimilated by the plant. There is no proof, so far as the writer is aware, that animal excreta accelerate the disintegration of the soil by natural agents. In a self-supporting area where no cattle foods or fertilizers are brought in from outside, and where the most careful conservation and application of the dung to the soil is practised, if there were no disintegration of the soil the losses of minerals in the produce removed from the area, and by erosion in the surface flow and ground water must in a very few years leave the soil barren in so far as profitable cultivation is concerned.

Such were the conditions in this country until the introduction of artificial fertilizers about a century ago (potash much later). Yet the fertility of the soil had continued to improve from the earliest times. *It follows, therefore, that the creation and maintenance of the fertility of the soil must be sought basically, in the disintegration of soil and subjacent rock.*

Continous Corn growing From the above arguments it follows that a uniform crop can be grown continuously on the same soil without animal manure, green manure or mineral fertilizers, provided the soil contains the minerals indispensable to the crop, and the crop is suited to climatic conditions. It may be objected that this is mere theory and is contradicted by practical experience. It is probable, however, that experience generally outside these islands is in accordance with the theory, e. g. in Russia, the United States of America, Canada, Australia and India. In the Central Provinces of India, wheat is grown continuously without fallow and without manure, and the yield per acre has increased since it was first observed and recorded in the 'sixties of the nineteenth century. The facts are in accordance with theory in Great Britain also, as was proved by Tull two centuries ago, and by the experiments at Rothamsted in growing wheat without manure or fertilizer continuously for the past 100 years.

It may be objected that rotation gives a larger or more valuable yield per acre in this country than abroad. The average yield of wheat per acre for the last 10 years is stated to be 32 bushels (2000 lb.) in Britain and only 13 bushels (820 lb.) in the United States of America. If it is assumed that the rotation in Britain is one of 4 years, the average annual yield per acre is only 8 bushels of wheat; if that of the corn in one other course of the rotation is included, the average annual yield of corn is only some 1000 lb. Most of the land sown with wheat in the United States of America is not under rotation, hence the reality, where *bread* is the sole criterion, is very different from the impression given by these figures. So far as the writer is aware, experiments have not been made in this country since Tull's time to ascertain the maximum uniform wheat crop obtainable without manure or mineral fertilizers; the experiments at Rothamsted have not been conducted precisely to that end. (*J. Minist. Agric. December 1942*).

Abstracts

Soil cultivation and Increased production by J. H. Hofmeyr, *Fmg. S. Afr. Vol, 17, No. 200, Nov. 1942.* Where moisture is in any way a factor limiting production and that includes the extensive maize growing areas of the Orange Free State, as well as other parts of the country, it is absolutely essential that rigid weed control should be practised in order to increase production or even, in some cases, to produce a crop at all. *Weeds and drought have an identical effect on the growth of maize and other agricultural crops.* Hence, the drier and more unfavourable climatic conditions are, the more imperative it is that effective weed control should be practised—and the sooner the better.

The production of maize may be considerably increased, without extending the cultivated area, merely by practising more effective weed control. Even for the more economical production of maize, better weed control by hand and inter-row cultivations are essential.

Although the use of a ridging plough for the inter-row cultivations of maize often yields excellent results, this implement should be judiciously used. The use of an ordinary cultivator appears to give more constant and generally satisfactory results provided the weeds are subsequently hoed by hand in the rows. The ridging plough also requires more tractive power and greater effort in handling than the ordinary cultivator. An additional disadvantage is that it leaves the land uneven, making subsequent ploughing more difficult.

The maintenance of a mulch appears to be unnecessary but generally speaking, under dry land production the number of cultivations, as well as the time of cultivation should be determined primarily by the appearance of weeds.

The additional cultivation just to maintain the mulch apparently have no or little effect on yield, and only increase production costs.

Under the prevailing conditions, when the scarcity of fertilizer and labour may definitely have a limiting effect on production, especially if the area under cultivation is injudiciously extended, it is essential that due account should be taken of the factors mentioned. This can be done only by thorough cultivation of the soil planted and the complete eradication of weeds in order to increase the *yield per morgen* as effectively as possible. The ploughing, fertilizing and planting of extensive lands frequently means a wastage of valuable fertilizer if the yield is low as a result of poor weed control due to a shortage of labour. In that case the weeds enjoy the benefit of the fertilizer.

In many cases it would pay farmers to bear in mind that the application of fertilizers cannot make up for neglect of proper weed control and the other operations associated with thorough cultivation. Not only the agricultural crop but the weeds also are nourished by the fertilizer and frequently the competition set up is to the detriment of the former, especially where moisture conditions are not so favourable. *(Author's abstract)*

Effects of weeds on growth of sugarcane. According to the *Report of the 61st Annual Meeting of the Hawaiian Sugar Planters' Association (1941)*, it had been previously shown that heavy losses of dry matter in plant cane were produced by allowing weeds to develop during the first six weeks. It has now been shown that, provided weeds are controlled during that period, later weed growth has a less marked effect. When controlled during 12 weeks in all, weed growth had but little effect upon yields: otherwise the loss was more or less proportionate to the cane's growth stage when the weed crop started.

At two centres no depression in cane yields at 15 and 22 months was produced when the final weed-control operation—ordinarily considered essential—was omitted, though in one case there had been a very heavy weed crop at three months. In both cases the initial early crop of weeds had been brought under control. At another centre the values of thorough weeding were claimed to be demonstrated: the yields were reduced if a heavy weed growth was allowed to persist while the cane was between 1½ and 4 months old. At another centre where partial weed control in third ratoon cane had seemed inadequate the final result was that less cane was harvested, but of better quality, and hence the same amount of sugar was obtained as from plots on which weed control costing three times as much had been practised. In view of these results further work on the weed problem appears necessary. *(Trop. Agriculture, Trin. February 1943)*

Rotation Experiments with Cotton in the Sudan Gezira. by F. Crowther and W. G. Cochran, *J. Agric. Sci. Vol. 32, part 4, October 1942.* Frequent fallows are the first necessity in any rotation for cotton in the Sudan Gezira. Cotton should not be sown more often than once in three years, and even that may be too frequent for maximum yields. Between cotton crops at least a year's fallow is essential and the longer the fallow the greater the benefit. Thus experimental results support fully the soundness of present rotation throughout the Gezira scheme. Up till 1932—33 the rotation was three yearly with at least one full year's fallow per cycle. Then the rotation was changed to four yearly with two or three years' fallow per cycle.

Inclusion of dura[1] in the rotation invariably reduces cotton yields. Least harm is done when dura immediately follows cotton, with at least one fallow year before cotton recurs. Lubia[2] was in no case markedly superior to fallow but may prove slightly more beneficial than fallow when included in a short

1. Sorghum, 2. *Dolichos lablab.*

rotation following cotton or dura. On the other hand, if grown after fallow, lubia decreases the cotton yields.

In view of the large increases regularly obtained from nitrogenous fertilizers the benefit of lubia is surprisingly small and that of fallow surprisingly great.

By contrast, fallowing on irrigated land in Egypt is rarely justified for a spell longer than two or three months, the period necessary for cultivation. The high value of the land there together with the expenses of canal digging and maintenance render fallowing uneconomical. Fortunately in the Gezira land is plentiful and cheap. If in the future its value rises and cropping has to be more intensive, lubia will replace much of the fallow; meanwhile fallowing is a simple way of controlling weed growth and allowing recovery of the land without expenses of cultivation and supervision. (*Author's abstract*)

Relation of soil organic matter to the production of flue-cured tobacco by H. A. Horton *Sci. Agric. Vol. 22, No. 9, May 1942.* Results obtained from field plot experiments with flue-cured tobacco have shown that there is a general tendency toward higher yields of marketable leaf from plots containing larger amounts of soil organic matter. Where tobacco was grown every year the highest yields and the highest total organic matter were obtained where manure was applied and rye cover crops were grown in the intervals between seasons. The 2-year rotations in which tobacco was alternated with rye gave greater returns per acre than where tobacco was grown every year. The 3-year rotation in which tobacco followed two crops of rye provided much larger yields and returns per acre, and the soil organic matter was considerably higher than where tobacco was grown every year. In the 2-year rotations the application of manure caused significant increase in the content of soil organic matter but it did result in considerably increased yields of tobacco. At the same time the level of the organic matter was maintained under the increased production.

While the soil organic matter may not have been significantly increased by applying manure or by returning the rye crops produced in a 2-year rotation, the production of leaf was enhanced by these practices. In this way the value of the crop was definitely related to the amount of organic material which was added to the soil. (*Author's abstract*)

Gleanings

Economic value of plants The common Stinging Nettle (*Urtica dioica*) found in Great Britain was very much used during the last war both by Great Britain and Germany and is also being used in the present war. The bast fibres are very strong and are composed of a very pure form of cellulose. They are used in the manufacture of textiles and also in paper making. Use can be made of the chlorophyll, while the leaves are rich in feeding value and can be fed to cattle.

Here in Rhodesia our two main fibre crops from an economic point of view are sisal, which is grown chiefly in the Sabi Valley, and sunnhemp, which can be grown practically all over Rhodesia. Up to the present the drawback about sunnhemp has been the difficulty in extracting the fibre, but this has now been overcome by the invention of a new machine made in Rhodesia, and it is hoped that in the near future sunnhemp will form a profitable industry in the colony.

Another plant of great economic importance at present is stramonium (*Datura stramonium* and *D. tatula*). A full description of these plants was given in an article in the last issue of this Journal and in the present issue a note will be found on the marketing of stramonium. This plant contains the alkaloid—Atropine, which is used as a nerve stimulant and also for the relief of asthma.

Supplies are very short in Britain, and South Africa is sending large quantities overseas. Rhodesia is also playing her part in the collection of this important plant, and with the help promised by the various Women's Institutes it is hoped that appreciable quantities will be collected in the Colony for shipment overseas.

The yellow flowered poisonous shrub *Thevetia neriifolia* is familiar to most of us, and is often found as an ornamental shrub in gardens. It has been found that the kernels of this shrub contain a powerful insecticide. The kernels are ground and soaked in water for about 24 hours, filtered and a little soft soap added to the filterate. The resulting solution was found to be very effective against various insects such as aphids. A concentration of ¼ to ½ oz. of kernel per gallon of water was found to be satisfactory.

Finally, as we are aware, citrus fruits are scarce at home and a substitute for these has been found in parsley. It has been proved that parsley is very rich in Vitamin C—the Vitamin which prevents scurvy, and that parsley can take the place of citrus fruits. A socalled 'lemonade' can be made from parsley. (*Rhod. Agric. J. November—December 1942.*)

Vegetable oils as lubricants Owing to the growing difficulty of obtaining mineral oils from the U. S. of America the Transport Advisory Council has recently given information regarding the development of suitable lubricants composed of vegetable oils to replace mineral oils. The present annual consumption of vegetable oils used as lubricants is stated to be as much as 8,000 tons of castor oil, 1,500 tons of blown rape oil by the Railways, and 6,000 tons in sugar and ginning factories, and oil, rice and other mills. It is estimated that if vegetable oils were used for all applications for which they are suitable in place of mineral oils, the annual consumption would be approximately 46,000 tons.

A number of tests have been carried out during the past two years using lubricants which consist of 100 per cent vegetable oil as well as a number of blends of vegetable oil and mineral oil. Well-refined castor oil has been proved to be as good a lubricant as any for locomotives, the bearings of steam engines and for all heavy gears. Blends of mineral oil and blown rape oil are being used as axle lubricants for railway carriages and wagons as well as for compounded marine engine oils. Blends of mineral and groundnut oil are useful for the lubrication of compressors, gas engines and looms. Coconut oil is also used for looms. During the year 1941 arrangements were made by which 800 tons of castor and blown rape oils were substituted for mineral axle oils in the Indian Railways alone. Actually this absorbed practically all the available production of suitable castor oil. Trial runs of over 2,500 miles of motor cars with blends of castor oil with either groundnut or rape oil for lubricants have shown satisfactory results.

It is reported that the petroleum companies are now considering the possibility of marketing mixed blends of vegetable and mineral oils for the production of which their requirements are likely to be from 12,000 to 15,000 tons of castor and rape oils per annum. (*Planters' Chroni. April 24, 1943*).

Two hundred cabbages a minute The increase in cabbage planting has made farmers more familiar with a machine which has been on the market for some time, known as the Robot transplanter. Four operators are seated around a tray of cabbage plants, which are picked up by the operators and placed into rubber clips conveyed by means of a belt around the top of the machine, and carried down and deposited vertically in a furrow made by a forward shoe. The furrow is closed by means of two wheels set at angles which press the sides of the furrow. This machine, which sets out 200 plants a minute can, by altering the clips be adapted for sowing potato seed, and has recently been fitted with a

water tank, so that plants can be planted in all sorts of weather during the proper season, *(Rhod. Agric. J. November—December 1942).*

Argentine storing corn under-ground The Argentine Ministry of Agriculture has announced the successful completion of an experiment to store corn in underground silos. A year ago 16 such silos were constructed in Cordoba, and the shelled corn stored in them was found to be in excellent condition when inspected recently. This type of storage is regarded as desirable because it would release wire and other essential materials ordinarily used in the building of maize stacks. *(Agric. Amer. September 1942)*

Motor fuel from sugarcane Experiments conducted at Louisiana State University by Dr. J. W. Jean have led to production from black strap molasses of a motor fuel called Jeanite. While not competitive in price with gasoline, the product is believed to have potential value for the several American republics which have no petroleum but do have extensive sugarcane.

Most other experiments in the use of grains and similar products for motor fuels have involved the production of alcohol for blending with gasoline. The new process avoids the objections of this procedure by producing entirely from molasses a fuel which is practically identical with gasoline in fuel value and octane rating. *(Agric. Amer. March 1942)*

Hints for Bee-keepers

For July, 1943

Unfavourable pasturage and weather conditions continue during this month also. A number of crops and trees such as maize, gingelly, *cumbu, babool, Peltophorum, Poinciana regia*, tamarind and drumstick are in flower, but the characteristic drizzly weather and the strong winds make it difficult for the bees to go out for foraging. Brood rearing is very poor and there is a steady reduction in the hive population. The information given during the previous month regarding the care of bee colonies applies to this month also. Special care has to be taken to ward off the bee enemies which are particularly active during these lean months.

Apart from the wax-moth, the bees have to contend with a few other enemies. The more important of these are (1) the black ant, (2) the yellow banded wasp and (3) the bee-hunter wasp. The occurrence and the habits of the black ant are too well-known all over South India to deserve any special mention here. Numbers of these ants sometime invade bee-hives and devour the food materials, brood and very often the bees also. The pest can be easily controlled by providing the hives with ant pans. Their underground colonies can be destroyed by dropping a few granules of calcium cyanide (a deadly poison) into the holes and closing them immediately. Dilute tar or kerosene also may be used. The yellow banded wasp can be often seen hovering about the entrance of bee-hives and carrying away stray bees. They can be handnetted and killed. These wasps, like bees, live in colonies in hollow spaces inside trees, walls, etc. Their colonies can be "gassed" with calcium cyanide after nightfall and the exit openings closed with clay. They can also be smoked or burned during nights.

A small bee-hunter wasp is occasionally found to cause appreciable damage to bee-colonies in certain localities. They are dark in colour with yellowish transverse bands, thick set and very active in their habits. They nest in underground tunnels in shady corners and sandy banks of fields. Relief can be obtained by digging out their nests or by hand-netting the adults. Besides these there are a few minor enemies which often infest bee colonies. The Death's head moth sometimes enters the hives and drinks away the honey stored in the cells.

but they are invariably killed by bees before they get out. Another minor bee enemy is the lesser wax moth. The caterpillars generally feed on the debris accumulated on the floor board, but they sometimes infest the stored combs. The hive and its parts should be kept clean and the caterpillars may be eliminated from the infested combs as in the case of the wax moth larvae. A few other insects like dragon flies, the wax beetle and leaf cutter wasps, and animals like lizards, frogs and toads and birds like the Drongo and the bee catcher, cause some minor damage but the loss is not serious enough to warrant any control measure. *M. C. Cherian and S. Ramachandran*

Crop & Trade Reports

Cotton raw, in the Madras Presidency The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February 1943 to 4th June 1943 amounted to 184,616 bales of 400 lb. lint as against an estimate of 430,400 bales of the total crop of 1942-43. The receipts in the corresponding period of the previous year were 229,070 bales. 245,308 bales mainly of pressed cotton were received at spinning mills and 639 bales were exported by sea while 99,024 bales were imported by sea mainly from Karachi and Bombay. *Director of Agriculture, Madras.*

Moffussil News and Notes

Agricultural Exhibitions—Salem district An agricultural exhibition was put up during the last week of April 1943 at Krishnagiri in connection with the Krishnagiri Taluk Tournaments. The exhibition was opened by the Sub Collector, Hosur. Posters on Grow More Food, better preservation of manure and other agricultural improvements were put up with suitable exhibits. Improved implements were arranged in the stall in the form "V". Specimens of E. C. 593 and local *ragi* plants and ear-heads of E. C. 593, A. S. 1543 *cholam* and Adt. 16 paddy were included in the exhibits and they were much appreciated by visitors. Specimens of locally raised vegetables, chini orange, pomelo, and mango fruits were also exhibited. Preparation of *ragi* malt and extraction of honey from bee-hives were the other items. A certificate of merit by the District Collector of Salem was awarded to the Agricultural Section.

An agricultural exhibition was put up in the premises of the Board High School, Tiruchengode, during the first week of May 1943 in connection with the tournaments conducted by the Rural Uplift Association. The exhibition was opened by the District Collector, Salem. Specimens of improved strains of paddy, millets, cotton and the local vegetables and fruits were put up in the stall. Explanatory notes and posters were put up by the side of each exhibit and these were instructive to visitors. Live plants of *bodantum*, *Cassia siamia* and *Glyricidia maculata* were exhibited with suitable posters explaining the prospects of their cultivation in the taluk. Posters on Grow More Food Crops and Vegetables was a special feature. A bee-hive with all bee-keeping appliances was put up and the economic aspect of bee-keeping as a cottage industry was explained to the visitors. The District Collector, Salem distributed 12 prizes (9 ploughs, by the Co-operative Societies, one P. S. G. 6. plough, one *mamooty* and 45 lb. of groundnut cake by the Department) and 13 certificates of merits to *ryots* of the Tiruchengode Taluk who cultivated maximum area under food crops.

D. A. O. Salem.

Estate News and Notes

The College The College reopened after the summer recess on the 15th June for the II and III year classes. Selection of students for admission to the I year class has been made by the Principal.

Imperial Sugarcane Station Rao Bahadur B. Viswanath, C. I. E., Director, Imperial Agricultural Research Institute, New Delhi, held a Durbar on the 14th June at the Imperial Sugarcane Station, to present the isignia and Sanad of Rao Sahib to Mr. R. Thomas, Assistant Sugarcane Expert. After the Durbar, Rao Bahadur Viswanath unveild a portrait of Rao Bahadur Sir T. S. Venkatraman, Kt. C. I. E., D. Sc. The function was held at the Laboratory of the Station. The guests who were invited for the function were entertained to Tea. The portrait was an oil painting by Mr. V. G. Emmanuel, and was much appreciated.

Visitors Rao Bahadur B. Viswanath and Sri K. Coomaraswami Chetty, Assistant, Marketing Officer, New Delhi, camped at the Estate during the month.

RETIREMENT

Mr. R. W. LITTLEWOOD, N. D. A., I. A. S.

Mr. R. W. Littlewood was born in June 1888 at Wakefield, Yorkshire. He was educated at Queen Elizabeth Grammar School, Wakefield, and Leeds and Reading Universities. He underwent training in farming and cattle breeding in Lord Middleton's Home Farm, Bridsall, Malton. He was in service in England in the Inland Revenue Department. He resigned his post to accept a Commission in the R. F. A. during the last Great War. He saw active service in France and was invalidated at the end of 1917. In 1918 he was appointed Horse Officer for the Somerset War Agricultural Committee and later in 1919 was appointed as an Agricultural Costings Officer, under the Ministry of Food.

He was appointed as a member of the Indian Agricultural Service in October 1920 and joined the Madras Agricultural Department as Deputy Director of Agriculture-Livestock, in January 1921. He had his headquarters at Coimbatore till 1924. When the Army Remount Depot at Hosur was handed over to the Madras Agricultural Department, it was converted into a Livestock Research Station and the office of the Deputy Director also was transferred to Hosur. He was responsible for the organisation and development of this excellent cattle farm which is one of the biggest and best cattle breeding stations in India. The Ongole Cattle Breeding Station at Chintaladevi and the Buffalo Breeding Station at Guntur were also under his control, until the stations were absolished in 1932. For a short period in 1936 he was appointed as Principal of the Agricultural College, Coimbatore. When the Hosur cattle farm was transferred to the Veterinary Department in 1938, the services of Mr. Littlewood also were transferred to that Department as Livestock Development Officer.

He was a member of the old Board of Agriculture in India and represented Madras at the first Imperial Agricultural Research Conference in London in 1927. He was a member of the Dairying and Cattle Breeding Committee of the Imperial Council of Agricultural Research. He has published various papers on cattle breeding and allied subjects, and his book on *Livestock of Southern India* is an exhaustive and practical handbook.

During the period he was Principal of the Agricultural College, Coimbatore, he was ex-officio President of the Madras Agricultural Students' Union.

He went on leave on 18th March 1943 preparatory to retirement and lays down his office on superannuation on 19th June 1943.

We wish Mr. Littlewood a long and happy life in retirement.

Departmental Notifications

Gazetted Service—Appointments

Sri V. K. Subrahmanya Mudaliar, Asst. Cotton Specialist, Adoni, to act as D. A. O. Kurnool.

Sri A. Chidambaram Pillai, A. D. Conjeevaram to act as D. A. O. South Arcot.

Sri M. P. Sankaran Nambiar, A. D. Dharapuram to act as Special D. A. O. Vizagapatam for Vegetables.

Sri V. Achutharamayya, F. M. Samalkota to act as D. A. O. Ellore.

Sri G. Sakharama Rao, A. D. Karkal to act as D. A O. Ramnad.

Sri V. Satagopa Ayyangar, A. D. Mayavaram to act as D. A. O. Tinnevelly.

Sri S. Venkatarama Ayyar, F. M. Palur to act as D. A. O. Nellore.

Sri P. A. Venkateswara Ayyar, Teaching Asst. in Agriculture, Coimbatore to act as D. A. O. Guntur.

Sri C. Jaganatha Rao, Asst. in Cotton, D. F. S. Hagari, is appointed to officiate as Asst. Cotton Specialist, Adoni.

Transfers and Postings

Sri C. Ramaswami Nayudu, on return from leave, is posted to act as Dy. D. A. Coimbatore vice Sri B. Ramayya on leave.

Sri U. Vittal Rao, D. A. O. Mangalore to be D. A. O. Coconada.

Sri S. Sitharama Pathrudu, D. A. O. Coconada to be D. A. O. Vizagapatam.

Sri M. V. Raghava Rao Nayudu, D. A. O. Vizagapatam to be Special D. A. O. for Vegetables, Vizagapatam.

Leave

Sri A. Gopalakrishniah Nayudu, D. A. O. Nellore, l. a. p. for 1 month and 5 days from the date of relief.

Sri K. Avidainayakam Pillai, D. A. O. (on leave) extension of leave on half average pay for 6 months on m. c. from 2—5—43.

Sri T. G. Muthuswami Ayyar, D. A. O. Tinnevelly, l. a. p. for 2 months from 1—5—43.

Janab A. Gulam Ahmed Sahib Bahadur, D. A. O. Kurnool, l. a. p. for 2 months from the date of relief.

Sri T. S. Ramasubramania Ayyar, Asst. Agricultural Chemist, Coimbatore extension of leave on half average pay for 1 month from 13—6—43.

Subordinate Service—Appointments

The following officiating appointments of Upper Subordinates, III Grade, are ordered with effect from 1st July 1943—

P. Narayanan, A. D. Hosur; L. Venkataratnam, A. D. Coimbatore; Ch. Soundararajan, Asst. Mycology Section, Coimbatore; K.N. Doraiswami, A. D. Ramnad; B. Srinivasa Rao, F. M. Coconut Station; A. Subramanyam, Asst. Millets Section, Coimbatore; N. Srinivasulu, A. D. Tadepalligudem; K. Narayana Rao, A. D. Hadagalli; A. Sankaran, F. M. Anakapalle; M. Gopalakrishna Kamath, A. D. Kollegal; P. V. Suryaprakasa Rao, A. D. Badvel; K. Bhaskaran, F. M. Samalkotta; K. V. Srinivasan, Asst. Mycology Section, Coimbatore; U. Sanyasi Rao, A. D. Podeli (Nellore Dt.); B. Vasudeva Rao, A. D. Dhone; V. Venkatasubrahmanian, Asst. Entomology Section, Coimbatore; B. Narasimham, A. D. Pattikonda; E. Jagannatha Rao, A. D. Madakasira; K. S. Suryanarayana, Asst. Chemistry Section, Coimbatore; D. Narayana Rao, Asst. in Cotton, Nandyal; Y. Chintamani, A. D. Parvatipuram; H. Narayana Kamath, A. D. Malabar district.

Transfers and Postings

Name of officers	From	To
Sri S. Muthuswami	Asst. in Fruit, F. R. S. Koduru	A. D. L. R. S. Hosur for the cultivation of vegetables.
„ A. Shanmugasundaram	A. D. Wheat Rust Control Scheme, Coonoor	Asst. in Paddy, A. R. S. Pattambi.
„ S. Mahadeva Ayyar	A. D. Kodaikanal	A. D. Koilpatti.
„ G. Doraiswami	A. D. Koilpatti	F. M. A. R. S. Koilpatti.
„ P. Somayajalu	A. D. Salur	A. D. Ramachandrapur.

Leave

Name of officers	Period of leave
Sri M. Suryanarayana, Asst. in Chemistry, Coimbatore	Extension of l. a. p. on m. c. for 4 months from 28—5—43.
Janab Muhammad Fasiuddin Sahib, Asst. in Cotton, Adoni	Extension of leave on half average pay on m. c. for 1 month and 15 days from 21—5—43.
Sri K. Cherian Jacob, Asst. in Botany, Coimbatore	L. a. p. on m. c. for 4 months from 24—5—43.
„ M. P. Narasimha Rao, Cotton Asst. Nandyal	L. a. p. on m. c. for 2 months from 17—5—43.
„ V. M. Ramunni Kidavu, A. D. Perintalmanna	L. a. p. on m. c. for 3 months from 6—6—43.
„ M. K. Swaminathan, A. D. Orthanad	L. a. p. for 1 month from 16—6—43.
„ K. B. Viswanathan, Asst. A. R. S. Marutur	L. a. p. for 5 weeks from the date of relief.
„ T. V. Srinivasacharlu, A. D. Sriperumbudur	Extension of l. a. p. on m. c. for 1 month from 20—6—43.
„ C. Venkatachalam, A. D. Tadepalligudem	Earned leave for 90 days on m. c. from 29—4—43.
„ M. P. Gowrisankara Ayyar, A. D. Devakottai	Extension of l. a. p. for 1 month from 21—6—43.
„ M. L. Narayana Reddi, A. D. Anakapalli	L. a. p. on m. c. for 1 month from 5—6—43.

An Appeal

The Editorial Board of the Madras Agricultural Journal will be glad to receive contributions from readers on subjects of agricultural and horticultural interest with special reference to the different aspects of the Grow More Food Campaign. It is requested that manuscripts are sent typed and do not exceed six pages.

S. V. Doraiswami
Secretary,
Madras Agricultural Students' Union.

SU. 24.

The "Priest": New 8th Army Weapon which outgunned Rommel.

Picture shows: The business end of a "Priest" 105 mm. self-propelling gun.

HOSTEL

TATLER

CONTENTS

Editorial Staff

Editor	K. V. S. Suryanarayanamurthi
Sub-Editor	K. R Narayanaswami
Representative—III year class	M. V. Gopalakrishna Sarma
» *II year class*	P A Srinivasan
» *I year class*	P. T. Bhaskara Panicker

Sectional Correspondents

Diarist	Ch Krishna Murthy
Artists	V. Rama Rao, K Rajagopalan and K. P. Kuppuswami
Publicity Manager	G Prabhakar Reddi
Foreign Correspondents	R. E Thomas and R Subramaniam
Local Correspondents	R. Venkatraman and O. V. Ommerkutty
Lighter Vein	E. R. C Vincent and Narasimhulu
Photography	T. Venkataswamy and K Sadagopan
Mess Correspondents	D Ranga Rao and A S. Krishnan
Our Cinema Reviewer	N. R. Adyantayya

The Tatler's Diary 1942—43

June	15.	The College re-opens.
»	16.	As usual some students begin serious studies.
»	17.	Mr. Kamath arrives with a large consignment of Mangalore *beedies* for distribution among the *beedi* patronisers.
»	21.	Hostellers busy due to the impending elections.
»	23.	Mr. Chengappa arrives with a hockey stick for his interview.
July	2.	Mr. Kamath goes to the first year blocks, impersonating the Warden but returns after receiving a 'grade'.
»	10.	Mr. I. L. Narasimharao lodges a protest with the Warden saying that a sufficient number of 'extras' are not being supplied to him.
»	24.	Mr. Francis Gurubatham attends the picture-house for the first time in his life.
August	11.	Mr. Ramanatham takes his monthly bath.
»	12.	Mr. Srinivasan resigns his Club secretaryship.
»	14.	Mr. Venkatraman is elected in his place.
»	15.	Mr. Venkatraman goes to the town for buying a suit and shoes.
»	26.	Maiden attempt by Messers Ramakrishna Sastry and Vincent at shaving.
Sep.	1.	Ramakrishna Sastry elected as the mess-representative for the new mess.
»	2.	Mr. Narasimhan attempts at spin-tennis.
»	17.	Mr. Nargunam buys a second-hand pith hat.
»	»	Most of the students leave for their homes as the examinations are over.
»	19.	Mr. Ammiraju replaces his *Kasi chembu* with a tin-can.
October	3.	The students return after the holidays.
»	5.	The examination marks begin to be announced to the inconvenience of some.
»	10.	Mr. Cripps arrives after having an extra spell of holidays.

Oct. 12. Messers Shanmugam and Govindarajulu enter the picture hall to see 'Doctor' but are surprised to see Sakuntala on the screen. They swallow the pill and return to the hostel disappointed.

" 22. The third year students leave on a week-end tour to Palghat.

" 23. Some casualities of the above trip take to bed.

" 24. The Grow More Food campaign is inaugurated in the hostel by the Warden.

" 30. The third year students leave for Palayakottai with five students less.

By Our Diarist

STOP PRESS

November 7th—Mr. V. L. N. Sastry beats the previous *idli* record by eating 26 *idlies* at a stretch. Our congratulations.

The Agricultural Graduate

A sound training in the basic sciences not only makes an agricultural graduate more proficient in his chosen field of applied science, but it also makes him a more versatile and therefore a more useful citizen in war as well as in peace. *L. E. Kirk, J. Amer. Soc. Agron. Dec. 1941.*

Five Annas

By R. S. KOLLEGAL

FOR five years myself and my wife were thinking of electrifying our house. As usual we never came to any definite conclusions. One day, I finished my meal and was about to start for the office, when my wife came to me with a long list of things like chimneys, kerosene, etc., to be bought that evening. She began—

"Considering all these things, it is better we electrify our house". I was surprised to see my wife come to such a definite conclusion in so short a time as five years.

"Yes! that's what I was also saying from the beginning. In these days almost all the houses are electrified and further if we electrify our house it would save you a lot of trouble. You would not have to clean the chimneys and lights nor pour oil on the ground thinking all the while that you are pouring it in the light."

"Oosh! you speak as though you are going to electrify the house to save me some trouble."

"Further, you finish off at least six chimneys in a month. That will be a saving hereafter." I continued.

"As if I wantonly do it. Sometimes they slip off and break. If you buy good, durable ones there would be no such difficulty. You always go in for third-rate stuff and you want them to last till your grand-son begets a son."

"At least so far as I am concerned, my brain refuses to work when I begin to write articles under oil lamps."

"Why blame the oil lamps for that when the mistake lies with your brains?"

All the while I thought she was trying to take the offensive, as usual, but when I learnt that she had actually taken it, I thought it advisable to change the topic in the interests of both. So I began,

"So, I will place an order with the local contractor to-day. In the evening be ready to go to the theatre."

"But we must know what the initial costs are likely to be."

"Why do you want that? You ask for every detail as though you are paying from your privy purse."

"Not that. What I meant was the monthly bill. Whether it would be economical or not."

"It is sure to be economical, so long as you do not break chimneys and waste kerosene oil."

At last, our house was electrified. Whenever she finds time she will be found standing in front of the meter. Fortunately the meter-board was inside the house and not on the veranda as in so many houses. In a week the meter showed '4'. I was just dressing myself up for the office when my wife came running to me and said.

"What is this? In a week the charge has come to Rs. 4. Hereafter we must be very economical. We must sleep before 9 o'clock and on no account should the light burn after that."

I nodded my head in approval.

Writing articles was my pastime. One night I was seriously thinking of writing a new and funny article—"Oh! these hen-pecks". I was thinking as to how the article should be—an essay or a short story or a narrative or in the form of a conversation between two henpecks—when came the thunder-bolt.

"Why are you sleeping with lights on?"

"Choo! don't disturb me. I am seriously searching for an apt word".

"Serious thinking does not require bright lights .. .." and she put out the lights.

I went and switched on the lights. But she again switched them off. This process of switching on and off happened for 5 or 6 times. I was not able to make out whether it was the beginning of a new life. I was reminded of the early married days......there my writing an article came to an abrupt end.

A month later the meter showed a reading of 12, only 12, my wife was shocked when she saw this and came to the quick conclusion, arrived at, all by herself, that the bill is Rs. 12. She thought I was duped and advised me to enquire in the municipal office. I was enjoying all this, though I felt for her innocence.

The next day the monthly bill was received, and it was only for Rs. 3 for 12 units. I showed it to her thinking that she would compliment me for my performance.

"So, only three rupees. How much we have saved this month! If we are careful we can save more" said I.

"Three rupees! What were the lighting expenses last month? Five bottles of kerosine at 2½ as. per bottle, six chimneys, three for the hurricane at the rate of 5 as. each, one at 2½ as. and another two for the bed-room light at 1½ as. each, three wicks at 3 ps. each. What does the total come to?"

Poor soul!, she did not know that I was not a Ramanujam, but only a graduate in natural science, who passed S. S. L. C. by the generosity of the Moderation Board getting a bare minimum of 25%

in Elementary Mathematics. So, I said at random "2—11—0" and that we are paying only 5 as. extra for the extra brightness we got for the house.

"What !, you say only 5 as. ?—in these days of economic depression 5 as. means 2 seers of good salt enough for a month. In a year the excess would come to nearly Rs. 4. You are very liberal in all these things but when it comes to the question of buying a good *saree* for me you say funds do not permit".

The reader may think that I belong to that group of fortunate people whom the world mercilessly and arrogantly call "hen-pecked". Only when you are hen-pecked—though others would think that you are in trouble with your wife—you would feel that you are in heavens.

That night I heard my wife murmuring in her sleep—"5 as. means 5 as."

A Doubt

Although he was very keen on his study, the new student to the dairy was finding things very strange there.

After having an incubator explained to him by the Manager, he was asked if he understood how it worked. With a puzzled look in his eyes, he replied :

"Yes ; but I can't see where the hen sits."

The Eleventh Commandment

"Thou shall inherit the holy earth as a faithful steward conserving its resources and productivity from generation to generation. Thou shalt safeguard thy fields from soil erosion, the living waters from drying up, thy forest from desolation and protect thy hills from over-grazing by thy herds so that thy descendants may have abundance for ever. If any shall fail in this stewardship of the land, thy fruitful fields shall become sterile, stony ground and wasting gullies, and thy descendants shall decrease and live in poverty or be destroyed from off the face of the earth." *W. C. Lowdermilk, Poona Agric. Coll. Mag. Feb. '43.*

Cambodia visits Karunganni

(An imaginary conversation among cottons)

By L. NEELAKANTAN

Prologue (While on a tour of sight-seeing in the black cotton soil of the Tirunelveli district, two cotton strains, Co. 2 and Co. 3 meet their confreres—*Karunganni*, *Uppam* and *Pulichai* and engage them in a pleasant conversation.)

Karungannis (*all*) Hallo! big brother, whither and on what errand ?

Co. 2 Just on a joy visit to this side of the country to renew old aquaintances. Let me introduce to you my cousin hailing from distant Uganda and married and settled in our country.

First Karunganni I believe he is Co. 3. We have heard much about him.

Second Karunganni (slyly) Ever since he came to these parts, I guess, our old brother has been losing popularity. I can tell it from his wan face. What brother, don't the good *ryots* need you any more?

Co. 2 Pray, gently, there is no need to be presumptuous. I am alright but what about yourself. Don't you know that since K. 1 rose amongst you, you are being eclipsed yourself. Funny that you should miss the beam in your eye.

S. K. We know that. He is our own dear cousin. Only he had the fortune of basking under the genial sunshine of Government patronage at the Koilpatti Agricultural Farm. So a special importance attaches to his name.

F. K. But have we not ousted out these *Uppam* chaps ? Has our big brother any such achievement to his credit ? He dare not measure his prowess with Co. 3.

Co. 2 (laughing) Oh! What folly to fawn on K. 1 on the slender plea of kinship. In a few years he will occupy every inch of land that you are now on. This is certain.

Co. 3 Suppose my cousin and myself go all out on a campaign of occupation in these places. I wonder if you can stand up to us.

(All the *Karungannis* burst into a peal of laughter and Co. 3 feels confused and awkward).

Co. 2 (smiling) Pardon, brothers he is yet new to the conditions obtaining here (turning to Co. 3) Funny, cousin that you talk in this manner. Don't you know we can't get on without plenty of water baled out from wells. In this dry black clayey soil where our friends here revel and make merry with what little of water that a miserly monsoon provides, there is none in our race who can stand a competition with them.

Co. 3 (apologetically) Sorry, gentlemen, but I don't mean serious. Er, cousin where can we see these *Uppam* people?

F. K. There, on a piece of elevated light soil you can see the *Uppams*. We have relegated them to such odd places.

Co. 2 Thank you, friends, good-bye.

Co. 3 Ah! these are the *Uppams*, I suppose. What grace and what charm. Gorgeous as the parrots and quite hale and healthy; how I pity their fate.

Co. 2 It is all appearance, sir, and nothing more. They do not have such quality stuff as the *Karungannis*, neither are they so industrious. They are weak and vacillating.

Uppams (all) Welcome brothers, how do the *Karungannis* fare. We saw you talking to them. They are a strong race and hate us.

Co. 2 Happy to meet you brothers, but why worry about the *Karungannis*. They dare not wipe you out from the district.

First Uppam No, they will do it; they can and are still stirring.

Co. 2 Can't you get on together in a spirit of co-operation.

F. U. No use brother. On our part we have been accommodating to the best possible extent knowing our limitations. Fortunately good mother earth has given us pieces of land which are not suitable to the *Karungannis*. While we are thus protected by nature from invasion, we are exposed to another temptation for which I hold our common phylogeny is responsible. Members of our race take a fancy for members of the *Karunganni* race and illegitimate unions take place resulting in the birth of a race of cross breds. While these images of sin may not be a serious factor among the *Karungannis*, they are a problem to us. Limited as our race is in population, these happenings tend to check further our efforts in maintaining our integrity and character unsullied from generation to generation. Alas! most of the good farmers consider us as inferior to the *Karunganni*.

Co. 2 Hang the *Karungannis!* haughty chaps. You too had your halcyon days and are still having a fine time in other parts of the world. You will see the downfall of these *Karungannis* ere long.

F. U. May be! they too are not quite happy. Quite recently another race is worrying them. This is the *Pulichài* race; it came somewhere from the north and bids fair to settle down comfortably in these places. Yonder, there on the fringe of our occupation, and quarrelling with some *Karungannis* in the out post of their territory, you see one such fellow; tall, scraggy with sharp features and a look of supreme contempt in his face; that is the *Pulichai* fellow; a cunning rogue. He is a nightmare to all of us in these parts.

(The *Pulichai*, not very far off overhears and addresses Co. 2.)

Pulichai Brother Co. 2, what timid creatures are these *Upbam* girls. I pity them. But these *Karunganni* fellows, well, I hear stories of a new champion among them, K. 1 they say. How is he like, brother. That vain prig is perhaps not aware of my valour. He may be the best of *Karungannis* but he can never trespass the border of his species. Let him not cross me. Very shortly I will be marching a whole army of my people to take possession of these lands. There is not space for us in our home, and we find this tract very congenial to colonise.

Co. 2 (smiling) Well spoken, burly rogue. You may be strong, sinewy, coarse, tardy and capable of much endurance. But these alone are not enough to keep your race away from the dangers of extinction. Where are the mighty dinosaurs and the giant mammals that ruled the land, sea and water in the ancient past. Brother, *Pulichai*, I am not discouraging you, but you make light of the qualities of K. 1 and there you commit a blunder. In days of yore the demon Kamsa spoke tauntingly of the Lord in His boy incarnation just as you are doing now and you know how the story ended. I am not quite sanguine about your future. God be with you, good-bye!

(A field populated with K. 1.)

K. 1 (all together) Welcome brothers Co. 2 and Co. 3. How do you do?

Co. 2 Yes he has not been here before and he is very eager to have your aquaintance; but pray how did you know my cousin Co. 3.

First K. 1 As if it were a wonder! We have heard a good deal about him and the description is exact.

Co. 3 Thank you, I too had just now occasion to know all about you through my cousin Co. 2. All the *Kaungannis* speak highly about your qualities of head and heart.

Co. 2 Why not? the good farmers and the benevolent Government themselves testify to his greatness. What better references need he have.

F. K. 1 Please, brothers save us from embarassment by these barefaced compliments. We are merely stirring hard to be of the best possible use to our benefactors. We pray God that He may help us in our efforts. Honestly we have no intention of competing with our cousins.

Co. 2 and Co. 3 God will help you, you will succeed, good-bye.

Co. 3 What modesty and what noble views. Though short and stubby these K. 1 are really people with substance. But why are they sad, some of them at least; I noted distinctly.

Co. 2 I too noted. Poor chaps. Their constitution is not quite up to the mark. You know the wilt disease that is causing so much havoc in other parts. Well, some of these K. 1 happen to possess low resistance and they succumb to the attacks. But they are being looked after properly; well, hurry up please. It is quite late. There an Agricultural Officer is expatiating on the qualities of K. 1 to a group of cotton growers. Let us hear him and then turn homeward.

Epilogue An Agricultural Demonstrator to a group of *ryots* somewhere in the Tirunelveli district.

"K. 1 is a pure and improved *Karunganni* strain of cotton born at the Agricultural Research Station, Koilpatti. There is a saving of a few rupees per acre by growing it in the place of *Karunganni* or *Uppam*. It yields 450 lb. of kapas to the acre whereas your local yields 300 to 400 lb. It has a high ginning percentage—33, whereas yours gins to 30's. A smaller area is enough to raise a required quantity of kapas for which a correspondingly greater area of your cotton will be necessary. You can utilise the extra space thus released for growing more food crops. So go in for K. 1 cotton".

A Specimen Application for Leave

Name of student: X. Y. Z.
Class: V.
Reason for absence, Tiffin not available.
Period of leave; From 8 A. M. on 6—10—42 to 11 A. M. on 6—10—42.
Number of working days: ½ a day

X. Y. Z.
Date: 7—10—42. Signature of student.

Remarks of the Warden

Produce M. C.
(Sd.)................ 8—10—42.
Not recommended.
(Sd.)................12—10—42.
H. W.
Date - 12—10—42. Signature.

Orders of the Principal.

See the Principal.
(Sd.)................13—10—42.
Not granted.
(Sd.)................18—10—42.
P.
Date: 18—10—42 Initials.

Communicated to the Warden: 20—10—42.
Communicated to the student: 25—10—42.
Returned to the office: 27—10—42.

(With due apologies).

My Hostel Experiences

By K. B. CHENGAPPA

(Herein we give you the experiences and feelings of one of the new students, from his own pen. We wish to tell the readers that the student concerned is not known to be a light eater. *Ed. Tat*)

OUR mess is the only non-vegetarian mess in the hostel. It is named so because most of the members in this mess are thorough non-vegetarians. But it ought to have been named as a semi-non-vegetarian mess as it is mostly vegetarian. Out of the 14 meals you take per week, you can expect only four times meat. When eggs and fish are considered to be vegetables and taken by many vegetarians, why not sheep be considered as inflorescence for its fleece? Because of this, I think so many who used to shudder at the sight of the N. V. Mess now join it in large numbers.

Early morning you have to get up and rush to the mess, if not, you may be late to the class. You must remove your slippers at the door. But if you happen to wear shoes or boots you have to remove them standing, running the risk of falling down as you may loose the balance while doing so. You find inside small planks raised hardly one inch above the ground and here also you must be careful lest you should loose your stability. The cooks with *dhoties* (which I am sure were washed before the beginning of this year) as black as tar will enter to serve. You will be supplied with 1 *dosai*, 2 *puries*, 2 *idlies*, or 2 slices of bread which may not be sufficient to reach even the oesophagus. The bread will not be with butter. I would propose in this case to have a dish of butter safely placed beyond our reach but in full view of all the members so that you point the piece of bread in the direction of the butter and satisfactorily eat it. You are supplied with coffee also which many of us suspect to have been prepared with quinine, being as bitter as Margosa.

Then you will go to the Central Farm, from which you will be taken to, most probably wet-lands. There you are expected to work, while it is quite impossible as there is no 'petrol' in the stomach to control the plough or the pair of bullocks. After sometime you will be asked to come out, but you will not be able to pull out your legs out of the mire. Anyhow you manage to come out as you want to return to the hostel. Then the Professor will give you some hints about the work you have done and how you could have done it better (if only you had stamina enough, to put forth.)

After this you will have to run to the hostel so that you can get water for your bath, as there are only two bath-rooms for 40 students.

I think that is why so many are becoming the members of the Anti-bathing Club. As there are eight bath-rooms for the Third Years who are 30 in number, you will be tempted to go there as there is more water. But those generous people will object to this and may even trap you inside the bath-room and declare in unmistakable terms that the bath-rooms and the flushouts are luxuries for the use of only the privileged Third Years. (Imagine the plight of the Third Years if 40 students raid the bath-rooms and latrines, constructed for the use of 30 students. *Ed. Tat*).

When you finish your bath, it will be about 11 A. M. and all, hungry like wolves, but, must wait for the arrival of the prey, for your attack will begin only at 11-30 when the mess-bell rings. For your mid-day meal you first get rice and ghee. You will be served next some curry 49 % brinjal and 49 % plantains which I think contains the most nutritive matter and vitamins as this is an Agricultural College. Some *sambar* comes next, which will contain some drum-sticks (which is supposed to improve the brain) suspended in it, or some tomatoes, once in a month, as these are the cheapest vegetables available in the orchards. After finishing your attack on this, you get *rasam*. This solution contains in it everything except pepper with which the *rasam* is supposed to be prepared. This, when poured out will be in floods in every direction and will threaten to go out of the leaf and so you must finish it as quickly as possible. After this solution, you are supplied with curd which is the only nutritive food in the mess. But I don't know why this has been also recently stopped. It may be due to the rationing of milk supplies, due to war.

At 2 o'clock you have to go to the class again. At the end of the first period you cannot remain there as you will be hungry again. You control this and come to the mess at 5 P. M. You will get some 'sweets', the contents of which no research scholar can analyse except the cooks who prepared it and a 'savoury' or a plantain and some 'mixture'.

After the night meals you come to your room and when the Warden finishes his rounds with his 'famous' petromax, you feel like eating again, but there is nothing except the books and the clothes in your room. So you will have to go to bed early so as to forget the hunger. Often water too will not be available in the jug as the venerable old gentleman who supplies drinking water might have been stranded on the way struggling with his bullock which is as old as himself. One good effect of our mess is that the agricultural graduates who become cultivators of their own lands may be prepared to withstand famines. So better join our mess as early as possible. Do not waste time. A single trial of our mess will lead you to become a member of our mess for ever.

Crowing

By NANDI

I happened to go through some letters written to students by their well-wishers in which I noted the following sentence. "Be friendly with your Professors and college authorities". Though the words were not the same in all the letters, yet all contained the same meaning and were more or less the allotropic modifications of the above sentence. What does this mean? Will it be that fatal word—that word 'crow-catching'? It is very difficult to find an answer to this question.

Here the scientists come to our rescue. Whenever the scientists are baffled by a certain phenomenon and whenever they find it very difficult to explain the why and how of it, they simply say that it is a law of nature. Like this 'crow-catching' may be said to be a law of nature. But there is no harm in defining it as follows:—

'Crow-catching' can be defined as that art or science; or both, by which the inferior sections of the humanity of this world try to win the affection and sympathy of the superior sections under different conditions of rank and position.

'Crow-catching' is in-born in everyone. Thomas Hughes said in *Tom Brown's School-days* that fighting of one kind or another is a law of nature. But I dare say that 'crow-catching' is a law of nature. When you are born in this world among the erring humanity you cannot avoid 'crow catching'. You have to do it in one form or other. But in some it is found only in a dormant form while in others it is well developed. Some are born 'crow-catchers', some achieve it and some have 'crow-catching' thrust upon them.

As I have said before it is very difficult to say whether it is an art or science. But it could not be a science because in our college where almost all sciences are taught, some necessary and some unnecessary, the authorities would have included this as a subject, if it is a science. Will it then be an art? In that case it would have been added as a subject in the III group in the Inter. Just as we have got Indian history, modern history and logic we will then have Indian history, modern history and 'crow-catching' or physics, chemistry and 'crow-catching' i. e., the III group will be a permutation and combination of physics, natural science, chemistry, mathematics, 'crow-catching', etc.

In these times when various experiments are being done to modify the system of education I would safely recommend the inclusion

'crow-catching' as an optional subject either in colleges or schools. It won't be out of place if a Diploma course is given in crow-catching so that the students will get the diploma D. C. C. (Diploma in 'Crow-Catching'.) Will they do it? I call upon expert 'crow-catchers' to give their calm, cool, and undivided attention to this problem. In these days of economic depression and unemployment it is a source of employment for expert 'crow-catchers', and they will be doing a great service to the 'crow-catching' humanity as well.

'Crow-catching' is a vast subject and it is beyond the scope of this article to explain it clearly. But it won't be out of place if I cited some of my experiences in the art of 'crowing'. While at school a teacher who was terribly wild and was rushing to thrash a boy was brought to a standstill, dumb struck when the boy murmured a few words. What were those magic words? The boy murmured, 'Sir, my father wanted me to ask you whether you will be kind enough to give me tuition in physics'. Certain conversations followed and some days later, it was a wonder to me when the teacher smiled even when the boy was unable to explain the Archimedes' Principle. For the teacher has become his tutor adding Rs. 25 monthly to his scanty income. What will you call this? Teacher 'crowing' boy or boy 'crowing' the teacher? Or both?

But in colleges you will rarely succeed in 'crowing' professors by promising to be a 'tution-boy' under him. Here you will have to adopt other methods.

When one wants to 'crow' a person, he must be very careful and must know when and how to 'crow-catch'. If you know this you have studied half the art. You must know the mood of the person whom you are going to 'crow catch', whether he has quarrelled with his wife, or whether he had a nice time with his wife, and so on and so forth.

Salutation is of first and foremost importance. How to begin the conversation? Here also you must use your intelligence. In some cases you can directly approach by saying "awfully bad weather, sir".

You may even talk of politics. But the important thing is you must never oppose his views. If he says that Napoleon was the King of England or Lord Ravana defeated Demon Krishna at the battle of Waterloo you must simply give an appreciative nod conveying, yes, even if you know well that he is in the wrong. This is the secret of success.

If you happen to see the son of a gentleman whom you wish to 'crow', you can consider yourself to be lucky and it is a red letter day for you. Easily approach him, nicely and scientifically, and load him with biscuits and peppermints and memorise him with your name

so that he can say to his father that you supplied him with those edibles. Be careful to wrap the edible in a secure way in a piece of paper. Otherwise the boy might eat it on his way and your whole attempt will be foiled.

After all, will inviting to dinner or garden party be a means to 'crow catch?' Yes, it is. But it is expensive, for you will have to pay for his dinner and the public may know why you asked the gentleman to dine with you.

Try to become, conspicuous in the eyes of the people whom you wish to 'crow-catch'. In an educational institution, when the lecturer asks whether you have any doubts, stand up at once and ask some doubts, whether you have got any doubts or not. Request him to explain the last year's portion once more or ask him any question, connected with the subject or not. What do you care? Your aim is to 'crow-catch' and the lecturer's aim is to teach and both will be satisfied. Ask him why he is having a turban, instead of a hat or *vice versa.* Ask him whether the flavour of Virginia tobacco will be the same in America, England, Germany, France, Australia and India. But of course you must be prepared for the eventuality of being snubbed. But don't be discouraged. Failure is the stepping stone to success. Go on. Let God be with you. Long live 'crow-catching'.

New Term Resolutions and Revolutions

Chengappa To come to the class as early as possible.

Thomas and party Not to hold separate classes during the agricultural practical class while the lecturer is telling something interesting.

Nambiar To take a bath at least twice in a month so as to smash all previous records and set up an example to his followers, the members of the A. B. C.

Story-teller Not to catch any more crabs by introducing frog's legs tied to a stick into crab-holes, as the animals will suffer much.

Hostel-steward Not to put water in the jugs on the verandahs as water is scarce and the monsoon is delayed.

Tobacco expert Not to interfere in the middle of a lecture too frequently.

Smoking volcano Not to absent from the classes for the sake of taking oil-baths and shaving.

Dhaincha expert To help the Grow More Food campaign, by lending his services fully.

Azimuddin To block all the windows and doors of his room and make it light-tight and air-tight, as a preliminary for future stay in A. R. P. trenches.

Hostel Radio driver Not to meddle with the radio too frequently so that it may work properly and the members may benefit by it.

Vincent Not to stay for more than 5 minutes in others' rooms.

Indian Women

By C. SRINIVASAN

SELF-forgetfulness and self-sacrifice form the focal points for which an Indian woman lives in an Indian home. As daughter, as sister, as wife and as mother, she lives to make the home an abode of peace, purity and patience. Her influence in the home is as great as that envisaged by her Western compeer under a civilization quite different in aim and aspect. The secret of this influence lies in her life of self-devotion to all that go to preserve the peace and prosperity of the home. She offers the most impressive exemplification of the fact that she sets herself wholly for the service of the family.

The nature of woman is evidently dependant in accordance with the concept of *Dharma* in every stage of her life, upon the father during girlhood, upon the husband in the middle age and upon the son in the advanced life. Though she is physically weak, she stands any amount of suffering and service. In the very organization of our society and home, an in its regulation, the woman plays no little part. It is not by strength and vigour that a woman gets distinguished, but by lovable service and suffering.

It is the law and custom of our land that lay hold on these endowments of nature and give it the environment needed for its perfect development, *i. e.* the life of honourable dependance on man. This does not mean a life of slavish subjection but it is freely assumed that they take the proper place in the home. The activities, the interests and the opportunities for earning distinction are entirely confined to the home. It is generally believed that if women engage in social and public affairs or for earning wealth and fame which the sphere of public life offers, this state of dependence which is so valuable to us and also suited to their essential disposition, will cease to be a reality. It is fiction to assert that our women do not receive any education at all but it is a fact that they do not receive an education which makes them into, like many of our men, endless quill drivers, rapid social reformers, or briefless lawyers. They are necessarily kept out of this because they are engaged in a more useful work of house-keeping. Even as matters stand, we have in our homes, women commanding genuine respect of all she knows. Indian women are quite satisfied with what knowledge they acquire at home, for it is considered sufficient for the due performance of their functions within the household. We all know her influence in all transactions of our domestic life. It is paradoxical enough, that even in a life of dependence she raises to unquestionable dominance in the conduct of the home and domestic expenditure.

Our educated men may struggle for years without success to dominate the province of house-keeping, having in view the family tradition so jealously guarded by the women of the house-hold. The religious life of the household is dictated by our women with their conservative instincts. The modern man's agnosticism and radicalism fade away before the determined Indian woman's pious devotion to her ancestral rites, customs and beliefs. "In the West, the woman is wife. To the Indian the whole force of womanhood is concentrated in motherhood. In the Western home, the wife rules. In an Indian home, the mother rules."

The existing conditions of the society in relation to the place occupied by women should never be altered. Any change to reform may destroy the very basis of our society. The excellence of this lies in the strength of passivity and can preserve itself against any insidious attempt to destroy the source of vitality of our ancient race.

Definitions

Gunter's chain It is a kind of chain used by hunters for tying the prey to a peg for hunting tigers.

Blastostyle It is the style of a flower with a polycarpellary pistil.

Monocyst It is a kind of reproduction common in the protozoan forms in which a single cyst is formed. Inside the cyst numerous forms are produced by division.

Pugmill It is a kind of machine involved in machine moulding. In this bricks are moulded by dry clay moulds. It is also applied at times to students who are able to mug well.

Educated-Weaned

By M. V. GOPALAKRISHNA SARMA

THE masses of any country, where progress is aimed at, look up to their educated brethern for leading them to a better and nobler plane in all walks of their life. In most of the countries the response from the latter is encouraging. But in our country it is otherwise. The reason may not be so clear as it ought to be; but yet it is there, vivid and visible, for those who bestow some attention on the conditions prevalent in this country. The pitiable plight in which our educated are placed is heart-rending. They have become the bane of the country in that they can support neither themselves nor others.

The gulf existing between the masses and the educated, as we find to-day, is very wide. We can call the intelligentia the "brain of the nation". There is a vital link between the sophisticated and the un-educated even as that between the brain and the body. Derangement of any one of these parts spells disaster for the entire system. Any move to bring about a drift between these two will disturb the equilibrium. If the country is to be rid of all these the educated must recognise their brethern, illeterate, as none else but the same stock from which they themselves have sprung up. They must feel and work as part of the populace. With the artificial barriers as are seen to-day, there is little hope of any real progress being achieved in the direction of ameliorating the distressed state of the people at large.

But unfortunately the educated are far removed from their natural seat of life. They have almost lost the identity with the life of the folk in the village. To them the village, with its supposed unbearable monotony, is least tempting, and the petty quarrels and quibbles are disgusting. They resent the very mention of rural life.

But the causes for this tragedy are not wholly theirs. They are brought up in an artificial atmosphere that supresses what all emanates from within. Having been stuck deep into the mud of false prestige, he who drudges from morn till eve will have no place in their mind. A thick opaque screen is placed between them and their toiling brothers who really feed the entire nation.

Having been trained thus the educated man will be dreaming of a rosy future, concentrating all his energies to win some laurels for himself. The last traces, if he has any, of his sympathies for those on whose sweat of brow he lives, will dwindle away into oblivion, when once he succeeds in his laurel-hunting. He who fails to get access to

what he aims at, feels helpless and slippery. He loses his self-confidence, and the future seems to him very gloomy and discouraging. He will be hovering between the outskirts of town and village, entering neither of the two; the former because he has been spurned in spite of his liking and craving, and the latter since he thinks it degrading to live there amidst rural folk.

We can now see how the educated have been weaned from the masses to the advantage of none. These two sections have been made into two water-tight compartments. Such isolation is harmful to the entire nation. Consequent on this segregation, the national standard in all spheres of life has been subject to steady deterioration. So it is our paramount duty, before it is too late, to dive deep into the whys and wherefores of this tragic state of affairs and soon establish a life-line between the intelligentia and the unsophisticated of the country.

First aid

Having attended a first-aid lecture, the young wife was quite pleased when the hubby came home looking and feeling seedy. Proudly producing her thermometer, she proceeded to take his temperature. The result so startled her that she sent a note to the doctor at once. " Please come at once, my husband's temperature is 136 ". Soon came the reply : " The case is beyond my skill send for the fire-engine."

Employ Agricultural Graduates

A modern war is a total war, so that matters of food production and problems of nutrition, are as much a concern of defensive and offensive warfare as the building of ships and aircraft. Hence technical agriculturists are as necessary to the war effort as engineers. It is not a question of guns or butter, it is really a question of guns and butter. *L. B. Kirk, J. Amer. Soc. Agron. Dec. 1941.*

The Final Blow

(A short story)

By NARASIMHULU

WE were then doing osteology in human physiology and on entering the lecture theatre, I beheld a new human skeleton, hanging from a stand. As it took a few minutes for the lecturer to come in and engage us, I sat gazing at the remnants of the human being, who was doing immense service to the student-world after his death. I was trying to imagine its owner's history both before and after death. Just then, 'boredom' entered the class room in the guise of a lecturer. I was taken aback at this expected but undesirable arrival. Outright he began his lecture and I had to follow him, though with a mild curse. Our lecturer did not seem to believe in the wisdom of doing one thing at a time. His amendment to this universal maxim was that 'two' should take the place of one, of course a matter of altering two letters. He would go on dictating and while we went on with the pen, he would his explanations, begin. Unfortunately we have no two heads though some had the privilege in mythology. Of course we all know how far our lecturer and we were successful in this dual attempt. Thus my thoughts about the skeleton vanished from my mind as darkness before the morning sun.

The 'great barons of my mind' did not allow any corner for the skeleton till I went to bed, after effecting a strict black-out, between the four walls of my room. As I lay on my bed, patiently bearing the music of the mosquito and musing on the skeleton, "the gentle thing, beloved from pole to pole" as Coleridge put it, took possession of me.

Suddenly the skeleton appeared before me not only clothed in flesh but also in fine garments, how beautiful and lovely! And narrated the following incident:—

It was a fine evening, calm and beautiful, in the month of May, when Mohan and I met for the first time in our lives, while going for a walk. Though we were accidentally introduced to each other we became friends and our friendship was cemented further, by frequent meetings. This friendship resulted in love for each other.

"I charge you, Kamala," he once said, "with the crime of usurping."

"How and why?" I enquired.

"By nature, as you know, I am an admirer of Nature. But now in comparison, She is next to nothing. Each touching scene that

passes before my eyes, makes me think, that grace, if at all they possess any, has been borrowed from you. Look at those green corn fields which fired to inspiration, by the gracefulness of your curls, are trying to imitate the wavy nature of your locks. The rich golden colour of the west, unable to compete with your rosy complexion, is receding into darkness. In short I transferred my love, admiration and adoration from nature to you!"

"By way of describing the graceful scenery you are uttering deliberate lies! But as per your transference of love etc. don't repeat the process once again!" I remarked with a laugh.

"Don't you prick my heart, my dear, with such harsh words. Though you utter them playfully, I am very much pained at the remark. My words are not lies, why! Not even exaggerations! You see those very flowers attracted by your beauty, are struggling to be detached prefering your locks. You know that Jagdish Chandra Bose once said that, when a lovely lady sees a beautiful flower, not only the lady wants to have it but the flower also equally desires to be in her locks. By-the-bye, when is our marriage to come off?" he asked, sending a smiling glance towards me.

"Why are you in such a hurry, Mohan, Hasty marriage seldom proveth well" I replied, returning the smile.

"May be," he said, "but, our marriage does not fit that description. I would we were married soon!".

"Let that be so!" With these words we started towards our house, hand in hand.

A few days after this incident, Raja Ram, a friend of mine, living in the same street as mine, called on me and told that he had something of importance to be discussed with me. After beating about the bush, enquiring about my health, and the whereabouts and welfare of one and all of our family members and relatives, he burst out—

"Kamala! I hold the olive in my hand. To be plain, I seek your hand in marriage".

This shock was quite enexpected and puzzled and perplexed me. Controlling myself I cooly told him, "Sorry, friend. I am not in need of yours. You may have the kindness not to speak on the topic any more".

"May I know what you mean?" he put in, with a face showing amazement, anger and shame.

"I mean what I say" I retorted.

"Then, is my offer rejected?"

"I can't but do so".

"Is there no possibility of altering your decision?"

"No, not at all!"

"I shall see". With these words on his lips he made an exit.

Two days later, Mohan told me that he was leaving our place the next morning with his father, for his native place. He assured me that he would be returning within a fortnight and promised that he would be writing to me. But later I did not receive any letter from him. Every morning would find me in great expectation in spite of consecutive disappointments. All my endeavours to get a clue of him were futile.

* * * *

* * * *

I was going through the strategic retreat of the German troops from X to Y, in the morning papers, when the post brought me a letter. Glancing at the writing I danced with joy for it was Mohan's. I rushed upstairs, to my room, to escape the notice of my mischievous brother. I carefully opened it and hurried through. Ho! what a surprise! letter in hand I fell to the ground.

What happend next, I do not know. When I regained consciousness, I found my brother and father sitting on either side of my bed and comforting me. After a time, my father went downstairs. I searched for the letter and read it again. It ran thus:—

Dear Kamala,

You will be greatly astonished to know that I have been married to my uncle's daughter. I was not able to go against my father's will. He denounced all inter-caste marriages and moreover my uncle's daughter is an orphan. She has none to look after herself and her property. Please excuse me. Shakespeare is right when he says marriage comes by destiny. It is vain to quarrel with our destiny. 'The decrees of destiny are immutable, its decisions have no appeal, what fates impose that men must needs abide'. Time is a perennial river and human beings are the suspended particles in its current. Two particles come together at times, float together for a time and finally they depart, as they should. I write this letter not in ink but in the blood of my heart, Excuse me. Adieu.

This time, I got wild not only with the author of the letter but also with the author who had been quoted. Did not that silly Shakespeare say that men are masters of their fates and that the fault is not in our stars but in ourselves. I doubted whether he has a heart at all. I sent a telegram, with the help of my brother, congratulating the 'usurper' of my heart.

Slowly I caught the wind of Raja Ram's wicked plans and evil intentions. The very place, which I liked so much was a disgust to me and the very scences which used to attract me hitherto were

mocking at me. They were even ashamed to face me. My disgust for this wicked world grew day by day and many a time I thought of putting an end to my wordly life. All these told badly on my health.

One day while at the hospital, I met the lord of my heart who did not even care to glance at me. When I saw him and Raja Ram, the cruellest of human beings, conversing intimately and sending a 'jeering' look towards me, my heart broke. Thus came the final blow and the worn-out string which bound me to this cruel world gave way..............................

After undergoing so many processes at the hands of ever so many doctors, who ate up my shape and beauty (of course a blessing in disguise) I am now.........................

At this moment, the terrifying skeleton stood before my mind's eye. Startled in sleep I dashed my leg against the table—the next moment, the lovely lady, the narrative, the skeleton—all vanished into darkness.

Latest Discoveries

The population of India is at the rate of 2½ people for every square mile —K. V. S. Murty.
The disintegrator is used for ceresan treatment—M. V. R. Somayajulu.
The heifers in the Palayakottai Cattle Farm deliver only male calves—C. S. Krishnaswamy.
The incubation period of tuberculosis is 3—4 days—M. V. R. S.
The alkalinity of the soil is due to the presence of salts in the soil, like sodium bi-sulphate, and is remedied by the application of Epsom salt.
Anemometer is a system of measurement adopted in the animal kingdom.
Castor seed is an example of nut.
Ipomea hesperidia is a tuber.
Aristolochia is a fodder grown in the wet-lands.

Phraseology of Agricol

By "GANI"

IT is not quite uncommon to come across certain curious phrases and idioms peculiar to a certain locality or institution. It may sound ludicrous to a stranger, but surely, it does give pleasure to use such phrases in our daily conversations. It is just a pinch of salt to make our chit-chat lively. Not only does it give charm to our talk but also lends fun and humour. If we just peep into the history of the coinage of such words, it will be interesting to note that it has always been prompted by some funny incidents or circumstances. We hear all sorts of malapropisms and 'bottomisms', of course not to speak of the mischievous touch of Mr. Pack who goes about in search of such materials. To be conversant with such phrases and to appreciate them fully, one should be aware of the antecedent or anecdote of each phrase or idiom.

Our college students are not, in any way, lagging behind in this respect. They can well nigh compete with any other institution in minting such phrases and idioms. Here are a few that are in vogue at present—Grade, Zambuck, Kommu, Bussing, Batting, I. P., Commentation, Awardment, Quarrellation, Thiring, Cockroaching, Sheet, C. C., F. Y. M., etc.

But unfortunately I am not aware of the time and origin of most of the above phrases, though I know their usage fully well. Indeed they form the legacy that our predecessors have bequeathed to us. Usually they are not what they were when coined. They have undergone ever so many changes and modifications brought about by the action of time, effort of individuals and the influence of environmental factors.

Enough of this "commentation", lest I should get a "grade" from the Editor, who, I understand, is "bussing" daily to town for the last one week, to purchase two quires of paper to type out the Tatler. Poor man! it seems he is daily getting only "zambuck" and not paper. Try, try and try again, Editor Sahib, but don't "buss"; that's too much of "kommufying".

If we did not trust one another,
We'd all have to live within our incomes.

Is it a Fact?

(If anyone of our readers is in possession of information, as to the truth or otherwise of these atatements and allegations, the Editor will be glad to pass on the information to others)

That Mr. S. Krishnaswamy, wears a *saree* and apes a nautch-girl whenever he is in the heat of discussions?

That Mr. V. L. N. Sastri attends the college 'physically' and not 'spiritually'?

That Mr. Krishna Iyer boasts, that but for the lac insect, we would not have got that Gramaphone, the 'music-grinder'?

That Mr. V. L. N. Sastri enquired of a shoe-maker as to the kind of leather of which the shoes are 'composted'?

That Mr. Janardana Rao feels giddy in his hind leg?

That Mr. N. Thyagarajan says that castor-oil is a saline purgative used in veterinary practice as an enema to wash the uterus?

That our Warden sometimes conducts experiments on the electric fan in his office in the Hostel, by keeping it switched on when he is out?

That Mr. Vincent goes round and round the long-block to collect waste paper to be sent to the Second-front?

That Mr. Chengappa is an expert at catching crabs using his newly devised method of introducing a rod with a frog at its end, into the hole?

That the formula of cupric chloride as discovered by Mr. Panicker is $CuSo_4$?

That one of the discoveries made by Mr. Narasimha Rao is 'an amoeba being eaten by a paramecium'?

That Mr. Nambiar and Mr. Sundaram Pillai have chosen the latrine for discussion?

That according to Mr. Suryanarayana Murty the evolution of plants is from sporophyte to gametophyte?

That Mr. Prabhakara Reddi threatens to resign his mess-representativeship every other day?

That according to Mr. G. Narasimha Rao, Black quarter is a seasonal crop?

That according to Mr. Janardana Rao, insects come under the big phylum Arachinida?

That Mr. Suryanarayana Murty takes refuge in the latrine whenever Mr. Sarma comes to his room?

That our Warden has issued orders prohibiting the issue of more than 5 'extras' to Mr. I. L. Narasimha Rao due to scarcity of food-stuffs?

That Mr. Krishna Murty prepares tissue-protein from cigarettes and beedies?

That the Government of Madras has appointed Mr. M. V. R. Somayajalu as the Information Officer of the Agricultural College?

That many of the First Years who had their interview at Coimbatore learned by heart many of the cricket rules, and some, the meaning of batting and bowling?

That Mr. P. A. Srinivasan's hat is sun-proof only when rain-proof cover is put on?

That the inmates of the Orphan Block were relieved of part of their distress when the A. R. P. trench was recently dug before their block?

Grow More Food Campaign.

THE whirl wind of the Grow More Food campaign has caught us in its grips. Rather we are already in it. The rationale of this compaign, every one of us knows. In the present war, Food is a munition of war. India was importing some food stuffs, mainly rice, from other countries, mostly from Burma. Now all those sources are cut off due to enemy occupation. To provide the population of India with all its food requirements we must grow more. This compaign was inaugurated in the Hostel on the 21st of October by our Warden Sri. P. A. Venkateswara Ayyar, B. A., B. Sc. (Ag.), with the help of students. We wish the compaign all success.

"Grow More Food"

Tiller of the soil,—arise and awake,
Life divine, in agriculture you make;
Crops of food we grow and raise
Are not sufficient in these days,
Our land of peace is in turmoil,
Starve you should, if you don't toil.

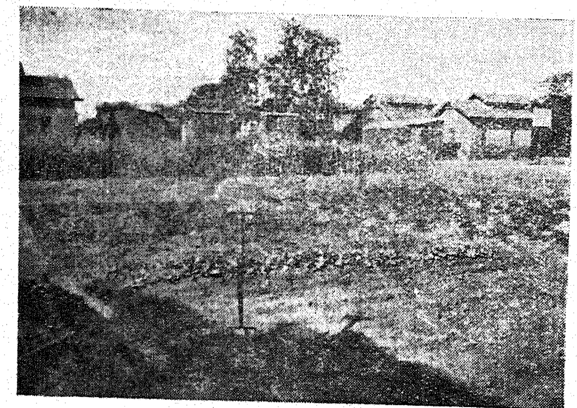
Burman rice will come no more
Our annual yield is so insecure
When land of ours doth tumble and break
Tiller of the soil—arise and awake.

Know you that Mother India is gold ?
All milk and honey in days of old ;
Ryots brave, you stand alone,
Fertilize the land you delve and own.

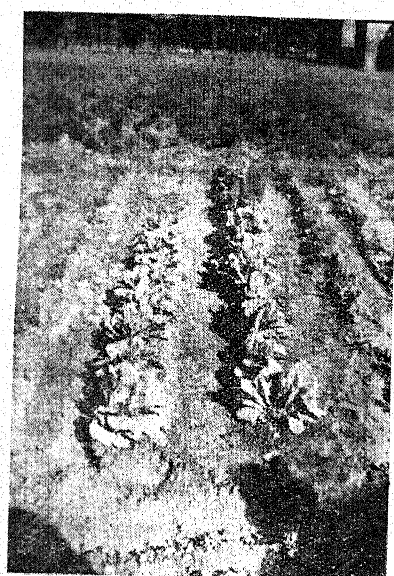
Bomb nor mine can do us nought,
Land of culture, wealth and thought ;
On you depends your own salvation,
Get rid of your procrastination.

Garden, backyard, fallow and hill
Are not for sight, must needs to till,
For the food you need—what do you care ?
Rise up and stand lest you fall—beware !

Second year Students of the College preparing the area for more vegetables near the hostel blocks.



"Grow More Food" Crops of maize and Vegetables grown by Students.



"'Grow More Vegetables'—gr eens grown by Students".

Improve the method of cultivation,
Discard old practice without hesitation;
Rice and *cholam*, *ragi* in all village,
Be your privilege to grow by tillage.

From well and pond and tank and lake
By every means, water you take
Irrigated crops, do oft give more,
Animal husbandry adds a little more.

Manure you store by methods strange,
Keep it away from weathers' range;
Spinach, plantains, amaranthus, tomato,
For hunger forget not sweet-potato.

If for health we use pounded rice,
The problem of food is solved in a trice;
Comfort you want ? do strain and sweat,
Your granary is full—ought be full, I bet.

Potato-sweet, makes for grains deficient,
In stress and strain we keep efficient;
Why cringe your hand—but follow a plan;
Earth divine is there, to help every man.

Oh! brother farmers! of every kind
Grow and eat—do not look behind,
Mother earth is kind to all improvement;
Forward, forward Agricultural Department.

K. Sanjiva Shetty

A military practice was taking place in the country side. The different 'Armies' were making manoeuvres under actual fighting conditions. An old woman unaware of all this, was passing along a road when she came to a bridge that was being guarded by a sentry on duty. When she was about to pass over the bridge, the sentry objected to it. When she asked why, the sentry replied—

"This bridge was blown off by the "Enemy" two days ago".

The old woman could not believe this as the bridge was apparently all right. So she asked another soldier who was passing along that road. He replied.

"Sorry madam, I was killed two days ago."

Four Fingers and a Half

By L. N.

EIGHT P. M. on a cold December night; the black-uniformed guard flashed the green light, and with a lusty whistle the Express commenced her long lonely journey. Passengers were not many that night, and the carriages were practically empty. Myself and another gentleman were the only occupants of a spacious eight-seater. I spread out my bed, and took my seat near the window. The gentleman opposite sat with his hands buried in the ample folds of his huge coat collar. His head was bent with chin resting on his chest. "A morose oily fellow", I muttered to myself. As the wind was raw and cold, I put on my 'monkey-cap' and obeying a primitive impulse peered out into the open to enjoy the beauty of the city environs by the night. The sight was fascinating. The electric lights, scattered far and wide, seemed to exult in wild delight, and I fancied, I even heard them scaring and shouting away at the pressing darkness.

Soon the gaiety and glamour of the city vanished and the train hurled itself into the vast blackness. It was newmoon night, and the occasional red flashes from the engine room throwing lurid glows on the open waste made the 'darkness plainly visible'. With a sigh I turned my eyes to my immediate neighbourhood inside the cosy compartment. My silent partner was still in the same posture. "Rubbish"! I said to myself, and taking the 'Hindu' a copy of which I secured at the book-stall on the platform attempted reading for a diversion. But the jolting caused by the rumbling of the rolling stock made it a sorry affair. Sleeping was out of the question though there was plenty of room available, because to oblige an over-solicitous friend in the city I had taken a cup of strong 'Madras coffee', late that evening. Talking was the only diversion I could next think of, but I wondered whether the stiff figure opposite me was in a mood for conversation. Reluctantly I grabbed the paper again and looked at the pictures on the last page.

"Any news, sir" asked the gentleman unexpectedly. I looked over, glad to have an opportunity for talking and I saw him studying me closely "Oh not much, but you can have the paper" I answered. "No thanks, I am averse to reading while riding because one can enjoy neither" he said and put aside the paper.

I noticed that his left hand was swathed in a loose white cloth.

Taking out a bakelite case he chose a cigarette and offered me another, which I accepted with thanks. He lighted both as per etiquette and I observed the bandage did not inconvenience him. It was

too loosely tied to be useful as a bandage and too cleverly done-up to be mistaken for anything else.

As if reading my thoughts he smiled and said "you are wondering at the kerchief on my left hand. Is it not? But do you believe in ghosts?"

"Why?" I querried amazed at this abrubtness. "Ah" he laughed aloud, "right in the middle of this twentieth century when man is about to overtake nature through marvellous scientific achievements, it does look funny to talk of believing in ghosts. I can quite understand your bewilderment. I am myself a scientist. Nevertheless I do believe in ghosts." He looked at me squinting his eyes.

"I had a personal experience, sir," he continued "and you will see tangible proof of it by and by. Let me narrate".

I was quite puzzled at this eccentric sort of gentleman, nevertheless, I got interested and settled down to hear his narrative.

"Well sir", he resumed, "I am a plant breeder interested in improving the quality and yield of the cotton races. Last year I had to work on a cotton farm in one of the hot dry districts of the Presidency. You know that cotton, unlike paddy, thrives in places where water is scarce. Places without good supply of water throughout the year, I believe, must be uncivilised and the people so crude and primitive in their outlook on life that superstitions do seem to have some truth there.

"One night as dark as this I entered a cotton field at 2 A. M. with the watchman of the farm carrying his lantern. The purpose was to make nocturnal observations on a few selected plants. It was my desire as with most other members of my fraternity to discover some phenomena in the vital activity of the cotton plant that could be offered as a homage at the shrine of truth. The night was sultry and except for the crunching of our heavy tread on the hard soil there was no other sound. I started my observations and was soon absorbed in my studies. Sometime after, I suddenly became aware of a faint cough nearby, I thought it was the watchman and did not worry further. But I heard it again, this time louder, but certainly not from the direction of the watchman. Then in the stillness of the night I heard a clear voice say "Oh! how greedy these plant breeders are." It was not the watchman for I knew he could not talk English. He was startled at the sudden change in my behaviour and looked at me suspiciously. "Did you hear anybody talk?" I asked him doubtfully. "No sir, no one is here" he answered quickly. I now got worried and began to feel nervous. My thoughts changed from science to ghost folklore. I felt a creepy sensation of terror. My fear heightened when I heard a hyaena-like laugh. "Didn't you hear that now" I screamed, catching hold of the watchman in a frenzy.

"Hear what" he said laconically and looked very much puzzled. At first he thought I was unwell, and that I was in the throes of a hysteric fright, but when I repeated my experience and dwelt on the possibility of gnomes and goblins roaming in the midnight, his countenance also fell. The light in his hand was burning bright. As I watched the steady flame I beheld a most uncanny sight. A bare hand as yellow as the light darted out somewhere from the murkey gloom and turned the pin of the lamp. The wick lowered and the flame burnt low. The watchman was now visibly agitated. Though he did not see the hand he could not mistake the sudden dimness of the flame and he must have even heard the click of the pin. When I told him I actually saw a hand, he jumped with a scream and flinging away the lantern took to his heels shrieking "ghost, ghost"! I too started to run but felt violently pulled by somebody. This time I could see something which I fancy must be a ghost. I saw a bright human head huge and spherical as the dome on an ancient minaret. It had clear facial features, but the face was so transparent that I could see through it the hazy stars twinkling in the dim horizon beyond. It had no trunk or legs. I could see the face and two hands only. These were suspended in the air in correct proportion relative to one another in position. As I looked on helplessly the sly face winked and smiled. It was mischievous but full of liveliness too, "oh! how greedy you are!" it repeated adjusting itself before me. I was encouraged by the smiling familiarity though its bizarre anatomy kept my fear in full tense.

"Look here" it spoke, "I will show you rare sights in the cotton land but you must promise me not to injure or take away anything. I wish you put your razor and other dissecting appliances into your pocket. Do you promise?

"Yes" I nodded.

"The next moment I felt I had turned round the corner of a dreary lane and I found myself standing on the threshold of a gorgeous panorama of glorious and splendid exhibits of rare and unusual cottons, the like of which I could never have fancied in my wildest imagination. There were plants bearing cotton in their burst fruits so full and profuse that the stem and branches were completely hidden. There were plants on which I could see beautiful bleached skeins of yarn from the fruits instead of the routine raw cotton, a few with actual woven pieces of cloth in their fruits, and yet a few on which I could see different kinds of cotton fabrics, shirtings, coatings, turban cloths, stuffed in the huge gaping fruits. But the most fascinating of all was a group of plants which had bright coloured raw cotton in their fruits. All the 'vibgyor' colours were there. With such cottons there was no need for dyeing. Bright and fast-coloured *sarees* could be woven from yarns of these rainbow-coloured cottons. The ghost went on explaining; I do not remember what all it said.

But my mind was fixed on the coloured linted fruits. I longed to possess some seeds. I forgot the promise I had made to the devil and in a rash moment I took the razor from my pocket and holding it in my left hand was about to reach for a fruit when I felt a terrific blow descend on the nape of my neck. I reeled and fell down, my left hand gripping the handle of the opened razor. While falling I experienced an agonising pain as though something was cutting away at me.

When I came back to myself it was broad day-light. A group of men were standing around me whispering anxiously. They said I must have swooned in a fit of hysteria and fallen over my razor. They would not believe me when I recounted my ghostly experience. Instead of listening to my account one and all of them looked at my left hand. It was only then I came to know of a grave personal loss. My left thumb was cut and the severed portion was lying a few feet away. A group of ants were hovering about the dead tissue. The cut end was clotted and swollen. The moment I made the discovery I felt a throbbing pain shooting from my amputated finger. It was so severe that I cried like a child. I was taken to a hospital where the injured thumb was attended to. And now, look—".

He held up his left hand and quietly removed the kerchief which had puzzled me all along. It was apparently healthy and there was no mark of recent injury or wound. But the hand had only four and a half fingers. In the place of the normal thumb was a squat, stubby tissue probably the lower-most phalange. I could see that the deformity was the result of an accident and not congenital.

"Do you believe in ghosts now?" he said gripping my shoulders suddenly and giving me a vicious shake. This was indeed an unexpected turn of events and I got more alarmed not to speak of the pain caused by the grip, when he stood up tightening his hold on me.

The train was slowing down. As I was wondering what would happen next he erected himself and in so doing knocked his head violently on the luggage rack above. Immediately he let go his hold and sat limp in his seat. He stared at me for a while like a man in the moon, and in the stare was the glint of murder. He attempted to smile but it expanded to a hideous grin and the oral muscles did not relax until the train came to a halt at the junction station.

As if awaiting, I hastily rolled up my bed, and stepped out of the compartment. The gentleman with four fingers and a half followed me up to the door and said in a tone of unusual sobriety "Sorry Mr. I don't know your name, but are you alighting here?

"No," I said gingerly as I stepped into the next compartment. "I need a quite undisturbed sleep. That is all."

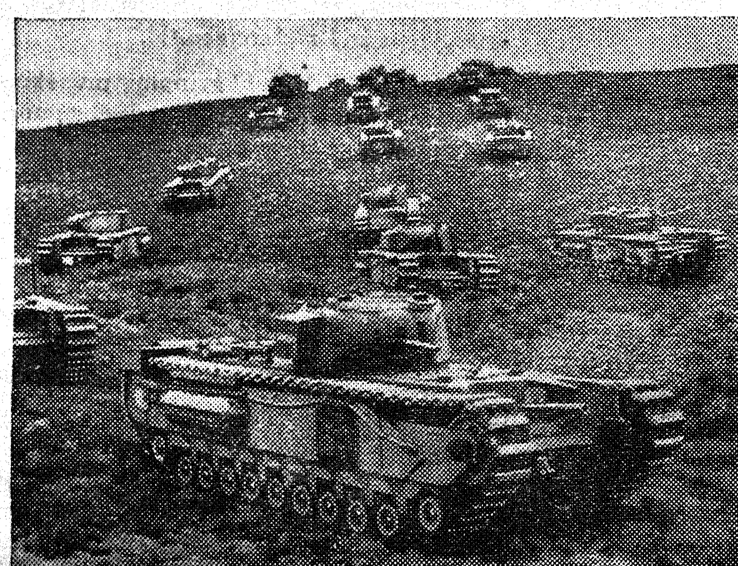
The Express resumed her journey.

Obituary

Y. V. S. S. S. Narasimhamurty Yerramilli Venkata Satya Surya Subramanya Narasimhamurty, comes of a middle class family of Tadepalligudem in West Godavary District. He joined the Agricultural College in the year 1940. He met with unexpected death due to short illness in the summer of 1942, after passing the Second Year University Examination. He leaves behind his young wife, father, mother, brothers and sisters and a host of friends to bemoan his loss.

Our heart-felt condolences are for his parents and his wife.

Dr. N. R. Rajaratnam Dr. N. R. Rajaratnam, G. M. V. C; P. G. (Edin.) comes of a christian family of the South. He passed out of the Veterinary College, Madras with a diploma. After some years of Government service, he proceeded to England for post-graduate study. He worked in our college for sometime as the Lecturer in Animal Hygiene. A man of very sociable disposition, he was our teacher both in and outside the college. Unfortunately, after his transfer to Saidapet he met with accidental death. He leaves behind his wife, sons, daughters and a host of friends to bemoan his loss. Our most sincere sympathies go to his family in their great loss.



SE. 4.

British heavy infantry tanks—Each a small fortress in itself.

"Churchill" heavy infantry tanks—A picture taken on manoeuvres some time ago. The "Churchill" is so strongly [illegible] as a pill-box, but at the same [illegible] speed. Six-pounder guns

The Madras Agricultural Journal

(ORGAN OF THE M. A. S. UNION)

Vol. XXXI JULY 1943 No. 7.

EDITORIAL

The Coconut Industry in India The record of the coconut industry in India has not been one of uniform progress and prosperity even though the coconut palm has been grown in the country from very ancient times, and the area under the crop has gone up to 15 lakhs of acres. The coconut industry, which flourished at one time, has passed through extreme vicissitudes, and during the depression days of the pre-war period was on the verge of collapse owing to the unprecedented slump in prices brought about mostly by the dumping of cheap *copra* and coconut oil from Ceylon, Malaya and other Pacific Islands. Consequently, the districts of Malabar, South Kanara and the States of Cochin and Travancore, wherein lies about 94 per cent of the total area under coconut in India, were severely hit. The coconut growers, who are mostly owners of small holdings, began neglecting their *topes*, abandoning inter-cultivation, manuring and timely control of insect pests and diseases which ravaged the palms and made them unproductive. The Government of India who were appraised of the situation, instituted an all-India enquiry in 1933, and subsequently imposed an import duty, which was not considered sufficient by the interests affected, to afford the protection it was meant to confer. The situation further worsened and the many oil mills and coir factories on the West Coast ceased working, and lay idle, with the result that thousands of poor people who were entirely depending upon this industry for their livelihood were thrown out of employment and left to starve. The position, however, improved to some extent with the spread of the present war to the Far East and the Pacific Islands, which cut off imports into India resulting in a general rise in prices of coconuts and coconut products.

Organised production and unrestricted imports from elsewhere have a far-reaching effect on a perennial crop like the coconut, which takes about 10 years to bear and which when once neglected cannot be revived in a short time. As already stated, coconut plantations in India are mostly in small holdings and the various producers are not well organized to pool their limited resources to enable them to withstand competition from other countries. In such circumstances the Indian grower has little incentive to invest money and increase production. With the present restriction of

imports of Ceylon *copra,* time is opportune for the initiation of concerted measures for the re-habilitation of the Indian coconut industry on a sound and permanent footing so that it may stand effectively against any future foreign competition. The recent announcement in the press that the Government of India have decided to constitute an All-India Central Coconut Board on the lines of the Indian Central Cotton Committee for placing the Indian Coconut Industry on a sound basis is to be welcomed. It is reported that the Board is to be representative of the concerned Provincial Governments and Indian States, of the growers, millers, coir manufacturers and appropriate trade interests, and that it is to derive its finance by levying a cess on the *copra* crushed which is expected to bring an annual income of about five lakhs of rupees. However, the general feeling as expressed in the local press appears to be that the interests of the growers who require the most help are not adequately represented. The oil millers feel that the levy of the cess on *copra* is one-sided, that the coir industry should also be made to contribute and that a portion of the import duty on coconut and its products should also be utilized for the upkeep of the Board. It is hoped that the Board, when constituted, will watch over the interests of the coconut growers, who were all these years sadly neglected, and assist in the development of the coconut industry by encouraging increased production and efficient marketing of coconuts and its derivative products, besides acting as an advisory body to the Central and Provincial Governments and to the Governments of Indian States concerned, in the matter of enacting suitable laws for the development and protection of the Coconut Industry. It is our belief that the inauguration of the All-India Coconut Board will instil confidence in the Indian grower that any investment that he may make in the coconut industry in future will not be a gamble as in the past, and that he may reasonably expect adequate safe-guards against foreign competition.

The College Day and Conference We are sorry to announce that the annual College Day and Conference that is usually held every year in July, under the auspices of the Madras Agricultural Students' Union, could not be held this year also due to War situation. We, however, hope that conditions will improve and that it will be possible to conduct the Conference on a future date. In the meanwhile, the Managing Committee of the Union are making arrangements for holding the annual General Body Meeting for the election of office bearers and passing the budget for 1943–44.

Mixed Cropping of Groundnut*

By C. M. JOHN, C. R. SESHADRI & M. BHAVANI SHANKER RAO,

Oil Seeds Section, Madras Department of Agriculture

Introduction Groundnut has of late become an important dryland crop in most of the districts and occupies normally about three and a half million acres in this Province. Due to the attractive price it fetches in the market and the fodder it supplies, there has been a phenomenal rise in the acreage sown to groundnut at the cost of other crops, chiefly cotton and cereals. In certain tracts groundnut is sown extensively in a proportionately large area leaving very little scope for any rotation being practised. In South Arcot, Kurnool and certain other districts where the groundnut area is more than four lakhs of acres, raising of groundnut in the same land year after year is very common and no reduction in yields has been observed on this score. The South Indian *ryot* has to some extent solved the lack of rotation by raising a mixed crop with groundnut. Loehwing (1937) has stated that under American conditions natural processes of nitrogen fixation restores about 60 lb. nitrogen per acre under legumes and 10 lb. under non-legumes. Inter-cropped legumes are also reported to increase available lime, potash and phosphorus in the soil. This probably is the reason for the maintenance of fertility in soils continuously cropped with groundnut.

Literature The benefits accruing to cultivators by mixed cropping have been elaborately dealt with by many agricultural investigators. Rangaswami Ayyangar and Sankara Ayyar (1941 and 1942) have discussed the advantages of mixed cropping. Patel (1935) in his review of the results of the rotation experiments of groundnuts and cereals at Palur concludes "*Cumbu*[1] is the ideal mixture crop for groundnut; but why this is so is not clear". Root studies at the Agricultural Research Station, Hagari, have shown that groundnut-*tenai*[2] mixture, as compared with horsegram-*tenai* and *pillipesara*[3]-*tenai*, is an ecologically sound combination, because the root systems have separate feeding zones This mixture was also found efficient in preventing soil erosion. Groundnut-*cholam*[4] mixture was also found a good combination provided there is a good distribution of rainfall. At the Agricultural Research Station, Guntur, cotton-groundnut gave the best monetary return per unit area. At Dharwar (Bombay) cotton and groundnut sown in alternate rows gave better returns than cotton and groundnut in separate blocks. It has been reported from the United Provinces that it is more profitable to grow groundnut between rows of redgram. It may be noted that these results are disjointed for the obvious reason that the experiments were conducted at different places and times,

* Contribution No. 23 of the Oil Seeds Section, Madras Department of Agriculture.

1. *Pennisetum typhoides* 2. *Setaria italica*
3. *Phaseolus trilobus* 4. *Sorghum vulgare*

and groundnut was not the main crop under consideration. With a view, therefore, to assess the relative efficiences of mixed cropping of groundnut with various other crops an investigation was undertaken. It will be logical at this stage to make a brief survey of the agricultural practices with regard to the mixed cropping of groundnut in Madras.

Agricultural practices Groundnut is grown in this Province either as a pure crop or as a mixture with other crops, chiefly cereals and pulses, during the rainy season. The system of cropping in a particular tract is governed by a number of factors such as soil, season, extent of holding, market prices, etc. *Ryots* owning extensive areas prefer growing a pure crop of groundnut, while those with small holdings resort to mixed cropping for the purpose of producing all their domestic requirements from the limited area at their disposal. Groundnut, however, is the main crop as it fetches a good value in the market.

In the northern districts of Vizagapatam and Godavari, groundnut is an early *punasa* crop (May-June sowing) and is generally sown pure. But it is also grown mixed with either gingelly[1] or redgram, of which the latter one is more common. Due to the late receipt of monsoon showers, sowing of groundnut is delayed to July-August in Kistna and Guntur districts. Here mixed cropping of groundnut with other crops is the universal practice. The nature of the mixture adopted depends on the nature of the soil. In black soils bunch groundnut is sown mixed with *cholam* and cotton, while in red soils castor or redgram enters into the mixture. In the Ceded districts, besides the above crops, a cereal, namely *korra*[2] also forms one of the components of the mixture. In the central districts of Chittoor, North Arcot, Salem, Coimbatore and Trichinopoly, groundnut is cultivated both as a pure and mixed crop. Redgram and castor invariably form the mixture wiih groundnut. These two subsidiary crops are sown in lines 6 ft. to 15 ft. apart and they are said to yield on an average about a bag, i. e, about 150 lb. per acre. In the coastal districts of South Arcot, Chingleput and Tanjore, redgram, *cholam*, *cumbu* and rarely gingelly are sown mixed with groundnut. Where early (June) rains are received groundnut-*cumbu* is sown because the short duration *cumbu* comes up for harvest in September before the onset of the heavy north-east monsoon showers. For late sowings, groundnut-redgram and groundnut-*cholam* mixtures are preferred. In the South Arcot district where the largest area under irrigated groundnut is raised, it is customary to grow groundnut mixed with *ragi*[3]. *Ragi* seedlings are transplanted early in January and a month later when it is given a hoeing; i. e., at the commencement of flowering, groundnut seeds are dibbled between the *ragi* plants. After the harvest of *ragi* in March the groundnut crop puts on good growth and gives a heavy yield. It is claimed that the cost of raising the two crops is met from *ragi* and that the income from groundnut forms the net profit.

---

1. *Sesamum orientale* 2. *Setaria italica* 3. *Eleusine coracana*

Experimental The experiments reported in this paper were undertaken at the Groundnut Research Station, Tindivanam (South Arcot District), with the object of finding out the most efficient of the common mixtures adopted in this Presidency. The soil of the station is red sandy loam and is representative of a large portion of the groundnut tracts of the Presidency. The mean annual rainfall is 40 inches of which 12 inches are received during the south-west monsoon and 23 inches during the north-east monsoon period.

Generally groundnut is sown mixed with one other crop, though at times even two or three crops are included in the mixture. The most common crops sown mixed with groundnuts being castor, redgram, *cholam*, cotton, *tenai* and *cumbu*, the mixed cropping of these six crops with groundnut was compared with pure groundnut. The crops sown and spacings given are furnished below:—

1.	Groundnut	A. H. 25	9″ between rows	and plants	9″	in the row.
2.	Cotton	C. O. 4	3′	»	»	9″	»
3.	*Cumbu*	Local	3′	»	»	6″	»
4.	*Tenai*	Local	3′	»	»	6″	»
5.	Castor	59-8-30	6′	»	»	2′	»
6.	Redgram	Local	6′	»	»	9″	»
7.	*Cholam*	Local	6′	»	»	6″	»

The field was prepared as for a groundnut crop and manured with town rubbish at 12,000 lb. per acre. A. H. 25 groundnut was sown to a spacing of 9 in. × 9 in. in July—August. The other crops forming the mixture were also sown to the desired spacing along with groundnut. To provide for the rejection of sufficient border rows at harvest and to have a uniform size of plot for reckoning the yields of the different crops, plots of two sizes had to be laid out. For the first four treatments, plots of size 50 ft. × 12 ft. and for the other three treatments, plots of size 50 ft. × 18 ft. were adopted so that after rejecting requisite borders, the ultimate size of plot in all cases was 44 ft. × 6 ft. or $\frac{1}{165}$ acre. Randomised blocks layout was adopted. To ensure proper stand, number of seeds were sown at desired distances in the case of the subsidiary crops and after germination the seedlings were thinned in one or two stages leaving one healthy plant per hole. Two hoeings and weedings were given to the entire experimental area during the growth period of the groundnut crop. After the harvest of groundnut, H. M. Guntaka (blade harrow) was worked once between the lines of castor, redgram and cotton to remove weeds.

To find out the effect of the subsidiary crops on the growth and the production of the main crop, detailed plant measurements and counts of immature and mature nuts were recorded at harvest on a random sample of 60 and 120 groundnut plants respectively under each of the treatments. Plot-war yields of groundnut and other crops were also recorded.

Details relating to the cost of cultivation of the different crops were carefully maintained. In working out the economics of the different systems of cropping, a uniform figure for the cost of cultivation of the groundnut crop was utilised in all cases and to this the extra cost involved in harvesting, threshing and cleaning of the produce of the subsidiary crop was added to get at the cost of cultivation of the different mixtures. Only standard rates normally adopted in the "cultivation sheets" of the Station were utilised for cost accounting. Details of these are given below:

		Rs.	As.	Ps.
Labour—One pair, one man and hire of implement	...	1	0	0
One man ...	... ...	0	4	0
One woman ...	... ...	0	2	0
Manure—Town rubbish per cartload	... ...	0	8	0
Seed Material—Groundnut kernels per lb. ...	...	0	1	0
Castor beans » ...	...	0	1	0
Cotton seed » ...	...	0	1	0
Redgram » ...	...	0	1	0
Cholam » ...	...	0	0	9
Tenai » ...	...	0	0	9
Cumbu » ...	...	0	0	9

Produce—

Groundnut pods	at 24 lb.	per rupee and	haulms	at 1000 lb.	per rupee
Cholam grains	» 25 lb.	»	straw	500 lb.	»
Cumbu »	» 25 lb.	»	»	500 lb.	»
Tenai »	» 25 lb.	»	»	500 lb.	»
Redgram	» 25 lb.	»	stalks	1000 lb.	»
Castor beans	» 16 lb.	»	»	1000 lb.	»
Cotton kappas	» 10 lb.	»	»	1000 lb.	»

The experiment was repeated for a period of three years, 1939-40, 1940-41 and 1941-42. The first season was characterised by a severe drought in the initial stages, resulting in poor germination and stunted growth of *cumbu* and *tenai*. A similar droughty period was experienced in 1940-41 in the early stages followed by excessive rainfall towards the end of the season. This affected the short duration crops, viz., *cumbu* and *tenai* and also the long duration crops, castor and redgram. The final season was fairly normal except for the occurrence of a cyclone in December which damaged to a certain extent the *cholam* and castor crops. Of the six crops tried, cotton was least affected while *cumbu* and *tenai* suffered most due to seasonal vicissitudes.

Results and discussion (a) *Groundnut* (i) *Growth* The average growth measurements of the groundnut plants under the different treatments for the three seasons are presented in Table I. From a study of the figures it is clear that the groundnut plants grown as a mixture with other crops have a tendency towards more lanky growth. This is probably due to the

shading effect of the crop sown mixed with groundnut. This effect is most pronounced in the case of groundnut-cotton mixture.

In the total number of leaves produced per plant there is marked reduction when it is grown as a mixed crop. The total number of leaves produced seems to be an index of the yields of the plant as the leaf number maintains almost the same rank as the plot-war yields.

TABLE I Mixed Cropping of Groundnut

Data on groundnut plant measurements (average of 60 plants)

Year	Treatments	Main axis		Primaries		Secondaries		Total no. of leaves per plant
		Length	No. of nodes	Total length	Total no. of nodes	Total no.	Total no. of nodes	
1939–40	Groundnut pure	14·9	20	124·8	84	7	70	177
	,, —*cumbu*	14·7	14	141·5	70	4	31	120
	,, —*tenai*	15·6	16	126·6	79	5	58	152
	,, —cotton	18·3	21	136·3	93	6	64	139
	,, —castor	15·7	19	128·4	80	6	53	151
	,, —redgram	15·4	17	123·0	81	6	54	152
	,, —*cholam*	16·6	17	116·2	73	5	48	139
1940–41	Groundnut pure	18·6	22	128·7	105	8	109	236
	,, —*cumbu*	20·4	21	132·5	92	6	85	198
	,, —*tenai*	21·0	21	138·3	95	7	98	214
	,, —cotton	21·3	21	142·2	94	7	89	204
	,, —castor	19·4	20	140·0	94	8	85	199
	,, —redgram	18·8	22	130·1	99	8	100	222
	,, —*cholam*	19·8	21	136·1	90	7	72	183
1941–42	Groundnut pure	34·7	26	254·7	113	11	142	281
	,, —*cumbu*	38·6	26	241·7	104	9	112	242
	,, —*tenai*	43·7	26	259·8	110	9	122	259
	,, —cotton	41·5	25	265·1	105	10	120	250
	,, —castor	35·0	25	234·1	104	10	120	249
	,, —redgram	36·6	25	238·0	105	10	123	253
	,, —*cholam*	39·1	24	227·0	95	9	102	221
Average of 3 years	Groundnut pure	22·7	23	167·0	100	9	107	231
	,, —*cumbu*	24·6	20	161·1	88	6	76	187
	,, —*tenai*	26·8	21	172·3	94	7	93	208
	,, —cotton	27·0	22	181·1	98	8	91	198
	,, —castor	23·4	21	167·6	93	8	86	200
	,, —redgram	23·6	21	163·5	96	8	92	209
	,, —*cholam*	25·2	21	158·3	86	7	74	181

(ii) *Yield* The yield of the groundnut crop grown pure and as a mixture was recorded for all the three seasons. The data together with their statistical analyses are presented in Table II. The results show that the yield of groundnut is always reduced when it is sown mixed with other crops. The extent of depression in yield depends on the nature of the crop grown mixed with it. The maximum reduction in yield (to the extent of nearly 50 per cent) has been observed for all the seasons in the case of plots sown mixed with *cholam* and the least reduction in yield has been observed for two seasons in the case of redgram and for one season in the

TABLE II Mixed Cropping of Groundnut

Groundnut yield data

Year	Particulars	TREATMENTS							Standard Error of mean	Critical Difference
		Groundnut pure A	Groundnut —*cumbu* B	Groundnut —*tenai* C	Groundnut —cotton D	Groundnut —castor E	Groundnut —redgram F	Groundnut —*cholam* G		
1939-40	Acre yield in lb.	1036	721	828	813	903	975	850	39·6	111·7
	Percentage on control	100	69·6	79·9	78·5	87·2	94·1	56·0		
	Conclusion	A F E C D B G								
1940-41	Acre yield in lb.	995	858	879	766	842	944	593	32·6	95·2
	Percentage on control	100	86·3	88·4	77·1	84·7	94·9	59·6		
	Conclusion	A F C B E D G								
1941-42	Acre yield in lb.	1258	724	915	803	725	693	415	60.2	173·8
	Percentage on control	100	57·5	72·8	63·8	57·5	55·2	33·8		
	Conclusion	A C D E B F G								
Average of 3 years	Acre yield in lb.	1096	768	874	794	823	871	530	59·7	184·0
	Percentage on control	100	70·1	81·6	72·4	75·1	79·5	48·4		
	Conclusion	A C F E D B G								

case of *tenai*. From the yield figures of the final year, it is seen that redgram which has recorded the highest outturn of the three seasons, has depressed the groundnut yield to a large extent. But *tenai*, in spite of its high yield, has affected the groundnut crop to the least extent. In the combined analysis of the three years' data also, *tenai* shows the least depressing effect on the yield of groundnut. Hence it must be concluded that among the crops grown mixed with groundnut, *cholam* has the maximum and *tenai* the minimum depressing effect.

Detailed study of the productive phase (Table III) carried out at harvest confirms the above conclusions.

TABLE III Mixed Cropping of Groundnut

Summary of the study of the productive phase of groundnut

(average of 120 plants)

Year	Treatments	Immature nuts	Mature nuts 1-kernelled	Mature nuts 2-kernelled	Total good nuts	Total kernels
1939–40	Groundnut pure	5·9	2·6	8·3	10·9	19·2
	" —*cumbu*	5·1	1·9	5·7	7·6	13·3
	" —*tenai*	6·1	2·6	7·5	10·1	17·6
	" —cotton	6·3	2·2	6·6	8·8	15·4
	" —castor	7·6	2·2	6·3	8·5	14·8
	" —redgram	6·9	2·2	7·0	9·2	16·2
	" —*cholam*	5·9	1·8	4·8	6·6	11·4
1940–41	Groundnut pure	14·0	2·3	7·7	10·0	17·7
	" —*cumbu*	14·2	2·6	7·1	9·7	16·8
	" —*tenai*	11·4	2·9	7·0	9·9	16·9
	" —cotton	12·1	2·5	6·2	8·7	14·9
	" —castor	11·2	2·3	6·9	9·1	16·1
	" —redgram	12·9	2·2	7·1	9·3	16·4
	" —*cholam*	11·8	2·0	5·4	7·3	12·8
1941–42	Groundnut pure	12·4	1·9	10·9	12·8	23·7
	" —*cumbu*	10·5	1·6	8·3	9·9	18·2
	" —*tenai*	11·6	1·6	8·1	9·8	17·8
	" —cotton	11·2	2·2	7·8	10·0	17·8
	" —castor	11·9	1·5	7·6	9·2	16·7
	" —redgram	8·5	1·5	7·6	9·2	16·7
	" —*cholam*	8·0	1·2	5·6	6·9	12·4
Average of 3 years	Groundnut pure	11·0	2·3	9·0	11·2	20·3
	" —*cumbu*	9·9	2·0	7·0	9·1	16·0
	" —*tenai*	9·7	2·4	7·5	9·9	17·4
	" —cotton	9·9	2·3	6·9	9·2	16·1
	" —castor	10·3	2·0	6·9	8·9	15·8
	" —redgram	9·5	2·0	7·2	9·2	16·2
	" —*cholam*	8·6	1·7	5·3	6·9	12·3

(iii) *Quality* The effect of mixed cropping on the quality of groundnut was also studied each season. Qualitative determinations consisting of shelling percentage, number of kernels to a pound, natural test weight per Madras measure of pods and kernels etc., were carried out on the produce from each of the treatments. The results are summarised in Table IV. It is seen that the quality of the nut is not affected by growing it mixed with other crops.

TABLE IV Mixed Cropping of Groundnut

Results of qualitative studies on groundnut produce

Year	Treatments	Shelling percentage	No. of kernels per lb.	N. T. W. of 1 M M. in gm.[1]		Percentage of oil[2]
				Pods	Kernels	
1939-40	Groundnut pure	70·4	974	582	1285	–
	,, —*cumbu*	70 7	986	588	1291	–
	,, —*tenai*	70·1	967	588	1291	–
	,, —cotton	70·9	970	590	1291	–
	,, —castor	70·4	952	589	1296	–
	,, —redgram	71·6	954	594	1292	–
	,, —*cholam*	71 6	970	599	1293	–
1940-41	Groundnut pure	72·6	1081	569	1257	–
	,, —*cumbu*	71·4	1096	556	1254	–
	,, —*tenai*	71·6	1126	562	1255	–
	,, —cotton	72·5	1072	573	1256	–
	,, —castor	71·4	1120	559	1248	–
	,, —redgram	72·4	1082	565	1253	–
	,, —*cholam*	72·6	1074	573	1271	–
1941-42	Groundnut pure	73·6	909	591	1195	51·31
	,, —*cumbu*	73 4	881	611	1206	52·23
	,, —*tenai*	73·7	912	607	1200	51·81
	,, —cotton	73·6	910	611	1203	51·94
	,, —castor	73·8	913	603	1193	50·58
	,, —redgram	72·7	943	603	1194	49·07
	,, —*cholam*	74·2	916	602	1192	51·54
Average of 3 years	Groundnut pure	72·2	988	581	1246	–
	,, —*cumbu*	71·8	988	585	1250	–
	,, —*tenai*	71·8	1002	586	1249	–
	,, —cotton	72·7	984	591	1250	–
	,, —castor	71 9	995	584	1246	–
	,, —redgram	72·2	993	587	1246	–
	,, —*cholam*	72·8	987	591	1252	–

1. N. T. W.-Natural test weight; M. M.-Madras measure (about 108 cubic inches).
2. Percentage of oil in kernels was determined only for the last season.

(b) *Other crops* The yields of the other crops sown mixed with groundnut for the three seasons are given in Table V. All the crops show the effect of the seasons in varying degrees. Of these, *cumbu*, *tenai* and redgram show extremes of variations ranging from very high yields to complete failures. But in other cases the seasonal effect has not been so marked. For this reason it appears desirable to select the crops least affected by the season, namely, cotton, castor and *cholam*, for being grown as a mixture with groundnut in tracts with environmental effects similar to Tindivanam. It is likely that elsewhere *cumbu*, *tenai* and redgram will be found economical to be grown mixed with groundnut.

TABLE V Mixed Cropping of Groundnut

Yields of crops mixed

Year	Acre yield in lb.					
	Cumbu	*Tenai*	Cotton	Castor	Redgram	*Cholam*
1939-40	264	322	248	535	295	720
1940-41	54	134	448	218	16	663
1941-42	606	631	224	413	606	444
Average of 3 years	308	362	307	389	306	609

(c) *Economics* The economics of growing groundnut as a pure crop and as a mixture with other crops was worked in each of the years. The results are summarised in Table VI. Generally growing of the mixtures is more remunerative than growing a pure crop of groundnut. Instances where mixtures have not given as much return as the pure crop are mostly due to the failure of the subsidiary crop forming the mixture and rarely due to the very low yield of groundnut as in the groundnut-*cholam* plots of the third year. Owing to the varying effects of the seasons on the crops tried, the economic ranking of the mixtures has not been the same in all the three years. Groundnut-castor in the first year, groundnut-cotton in the second year and groundnut-redgram in the third year have given the maximum profits. But taking the averages of the three years groundnut-cotton stands foremost followed by groundnut-castor, groundnut-redgram and groundnut-*cholam*. These four mixtures appear to be the most remunerative.

TABLE VI Mixed Cropping of Groundnut

Economics of Cultivation on acre basis (in rupees)

Year	Particulars	TREATMENTS						
		Groundnut pure	Groundnut —*cumbu*	Groundnut —*tenai*	Groundnut —cotton	Groundnut —castor	Groundnut —redgram	Groundnut —*cholam*
1939-40	Value of groundnut	49	34	39	39	43	46	28
	Value of the crop mixed	—	13	15	26	34	16	41
	Gross return	49	47	54	65	77	63	69
	Total cost of cultivation	39	44	44	48	46	44	45
	Net profit	10	3	10	17	31	19	24
1940-41	Value of groundnut	46	40	41	36	38	44	27
	Value of the crop mixed	—	3	6	47	15	1	39
	Gross return	46	43	47	83	53	45	66
	Total cost of cultivation	37	40	41	46	42	40	44
	Net profit	9	3	6	37	11	5	22
1941-42	Value of groundnut	53	31	39	34	31	29	18
	Value of the crop mixed	—	30	28	24	31	35	27
	Gross return	53	61	67	58	62	64	45
	Total cost of cultivation	28	35	34	32	32	31	33
	Net profit	25	26	33	26	30	33	12
Average of 3 years	Value of groundnut	49	35	40	36	37	40	24
	Value of the crop mixed	—	16	16	32	27	18	35
	Gross return	49	51	56	68	64	58	59
	Total cost of cultivation	35	40	40	42	40	38	40
	Net profit	14	11	16	26	24	20	19

Conclusions To sum up, raising of a mixed crop results in lanky growth of groundnut and this is more pronounced when cotton is the crop mixed. The yield of groundnut is also reduced, *cholam* causing the maximum depression, while *tenai* affects least. The causes for this reduction probably depend both on the duration and root behaviour of the crop

sown mixed. It is interesting to note that long-duration crop of castor and redgram do not depress the yield to any large extent and *tenai* does not depress the yield to the same extent as *cholam* though both these have the same duration. The quality of the groundnut as indicated by the various tests is not affected by the mixed cropping. The most important matter with which the *ryot* is concerned is the net return from unit area. In this respect mixed cropping is decidedly more paying than a pure crop of groundnut. The ranking of the various mixtures is slightly different in different years, probably due to the seasonal effect. It must be realised that while mixed cropping is generally to be recommended, the selection of the crop to be sown mixed with groundnut has to be done carefully. Crops like *tenai* and *cumbu* which fared badly at Tindivanam as compared with *cholam*, cotton and castor, may behave differently in other tracts.

Summary The effect on growth, production and quality of produce of groundnut crop when grown as a mixture with *cumbu, tenai, cholam*, cotton, redgram or castor during the rainy season (July—December) has been studied and the economics of growing the mixtures and the pure crop worked out.

The groundnut plants have a tendency for lanky growth when sown mixed with other crops.

The groundnut crop also suffers reduction in yield, when grown as a mixture. The maximum depression in yield (50 per cent) is observed when grown with *cholam* and the minimum depression in yield (19 per cent) with *tenai*.

Among the crops tried as a mixture with groundnut, cotton was least affected by seasonal conditions.

Mixed cropping of groundnut with other crops is more remunerative than raising a pure crop of groundnut.

Mixed cropping of groundnut with cotton, castor, redgram or *cholam* is more profitable than with the other crops tried.

Literature.

Loehwing, W. F. (1937) *Bot. Rev.* 3, 195.

Patel, J. S. (1935) *Madras Agri. J.* 23, 352.

Rangaswami Ayyangar, G. N. & Sankara Ayyar, M.A. (1941) *Ibid* 29, 57.

— — — — (1942) *Ibid* 30, 3.

The Cultivation of Vegetables in the Northern Circars

By A. SANKARAM, B. Sc. (Ag.)

The important role that vegetables play in our diet, providing the necessary proteins, carbohydrates, fats, vitamins etc, is too well known. The need for the systematic development of market and kitchen gardening, with a view to overcome the shortage of food at the present moment, is very great. In the Northern Circars not more than 48,000 acres is utilised for vegetables, although the scope for their culture is exceedingly great. The province of Madras claims nearly 3 lakhs of acres under vegetables out of the 28 million acres occupied by different food crops. This is obviously insufficient to cater to the needs of the population.

Types of vegetable gardening The types of vegetable gardening met with in the Northern Circars may conveniently be divided into two sections based on the object sought and methods employed in producing and disposing of the crops.

(i) *Kitchen gardening* This type of vegetable growing has for its aim the production of vegetables in the back yard of the house solely to cater to the daily needs of the kitchen. It is a hobby giving both pleasure and profit. Limited holdings and nearness to the house form the outstanding features of this type, and their up-keep and development entirely depend on the availability of land and personal care and attention of the owner.

(ii) *Market gardening* This type of vegetable growing has for its object the production of vegetables for markets situated in towns and cities, and is the most common and popular type of gardening in the Northern Circars. Suitable land in the neighbourhood of towns and cities is most desirable. A fairly fertile land with some reliable source of irrigation will be suitable for this. Intensive cultivation with adequate manuring to maintain the fertility of the land, is essential for the success of this type of gardening.

Soils The garden land soils of the Northern Circars naturally vary widely in their fertility from place to place but on the whole are well adapted to vegetable culture. In certain localities the wet lands also offer scope for raising vegetables of the type of gourds, plantain and yams. In some localities the land is more of a sandy nature, which when well supplied with organic manures, prove suitable for successful vegetable cultivation.

Season and rainfall In the Northern Circars the season can be divided into three periods, viz., (i) the south west monsoon (June to September), (ii) the north-east monsoon (October to December) and (iii) the summer or dry season (January to May). The monsoon during the first season brings 40 to 45 in. of rainfall to parts of North Vizagapatam and the Vizagapatam agency. It gets feeble as it passes to the Godavari districts where the precipitation is only 36 in. There is a progressive decrease in the

districts of West Godavari and Kistna to below 40 in. and it is only about 30 in. in the Guntur district. During the second monsoon there is less rain on the hills, and all the districts in the plains receive about 10 to 12 in. only. In the summer period a few showers are received in the entire tract and are popularly known as "mango showers". The amount of rainfall received varies from 2 to 5 in. Dependent on the rainfall, there are three seasons for the sowing of the vegetable crops, viz., (i) the monsoon or *tholakari* (June), (ii) the winter (October—November) and (iii) the summer (February). The rains of the south-west monsoon are taken advantage of to raise most of the vegetables. With the setting in of the north-east monsoon rains different kinds of gourds, brinjal, tomato etc., are grown. But in the summer season great difficulty is experienced in securing water for irrigation. Conditions of weather are always very favourable in the first two seasons for producing bumper crops, with less expense for irrigation. The relatively higher prices of vegetables in summer compensate to a certain extent the increased cost of irrigation.

Lay-out of vegetable gardens Based on the nature of the soil, the plot is first divided into different blocks. Parts of the field with soils of a heavy nature are utilised for root crops like yams, sweet potato and colocasia. Other blocks with light loamy soil are set apart for vegetables like brinjal, lady's finger and gourds. High level plots with drainage are particularly set apart for the culture of greens. In the vicinity of the water source, a small high level plot is usually used for the nurseries.

Tillage An optimum tilth brought about by 8 to 12 ploughings with the wooden plough depending on the previous crop, is all the preparatory tillage given to the lands to bring them into condition for sowing. Generally great care is bestowed during the growth period of the crops, and clean cultivation is maintained.

Manures The only manure that is commonly used is the cattle manure. Vegetable crops in particular give marked response to large dressings of well prepared composts and town refuse. Adequate manuring will be amply repaid by higher yields. The growers therefore will do well to conserve all possible farm wastes and convert them into valuable manure by composting as suggested by the Agricultural Department.

Irrigation Irrigation is a matter of great importance in the successful cultivation of vegetables. Irrigation with a *picotah* (counterpoise bucket lift) is commonly adopted in the Vizagapatam district. Of late, in and around Anakapalli the improved water lifts, the circular mhote and the persian wheel are becoming popular. In the Godavari districts, besides lift irrigation with mhotes, cannal irrigation is also common.

Harvest and marketing Vegetables like brinjal and gourds are usually harvested in the evening and transported next morning to the neighbouring markets; greens are always gathered very early in the morning, for it is only in their fresh condition they are salable. Excepting the root crops, other vegetables do not keep well after a couple of days.

Vegetables intended for sale in the distant markets and weekly fairs *(shandies)* are usually packed in palmyra leaf baskets and transported in bullock carts in the Vizagapatam district. In the districts of Godavari, transport by boat is very common. Gardeners who are not in the neighbourhood of towns dispose off their entire crop, before harvest, to middlemen. The middleman undertakes the harvest operations and sells the produce to retail market vendors. Where market gardens are advantageously situated within easy reach (2 to 3 miles) of towns or cities, growers sell their produce directly to the retail market vendors, thus avoiding the middleman. A few gardeners even effect direct sale of the vegetables to the consumers. However it is very unusual to find the growers coming into direct contact with the consumers. It is this that is responsible for the disparity between the price received by the grower and the price paid by the ultimate consumer. At Anakapalli certain dealers are engaged in the export of vegetables and derive very high profits. Retail sale of vegetables at the very door of the consumer in towns is common in the Godavari districts and of late this practice is slowly creeping into parts of the Vizagapatam district also.

Seed selection and preservation A majority of the common Indian vegetables are raised from seed. The first few fruits are generally set apart for seed. It is not uncommon to find seed being collected from odd ripe fruits that escaped harvest but were noticed at the time of pulling out the crop. This will result in reduced yield and quality. Well-grown vigorous plants, free from pests and diseases should be set apart expressly for seed collection. In the Northern Circars many market gardeners exercise a certain amount of care and attention in the collection and preservation of the seed required. Vegetable seeds are usually sold in the weekly fairs *(shandies)* but they are not of dependable quality. For preservation till the next sowing season, seeds of brinjal, greens, etc., are kept in cloth bags in a covered narrow-mouthed mud pot. Seeds of snake gourd, bitter gourd and cucumber are imbedded in *bratties* (dunk cakes) and dried. The dried cakes are carefully preserved in mud pots. Dry fruits of ribbed gourd, bottle gourd, *bendai* (lady's finger) etc., are kept in a safe place free from damage by rats and other pests. Seed is also kept in tins provided with tight-fitting lids.

A profitable enterprise Satisfactory returns are obtained from well-grown vegetables of the more common kinds viz., brinjal, yams, gourds, lady's finger, etc., and it is not therefore very surprising if these crops rank high amongst those to which the grower turns his attention. In very favourable seasons the profits are substantial. But the fickleness of the monsoon in certain localities and in certain seasons, resulting in higher expenses for artificial irrigation or at times by the damage of insects often reduce the profits. Nevertheless, market gardening is still accepted as a profitable enterprise in the Northern Circars.

Notes Brief notes on the cultivation of the common vegetables is given in a tabular form as an appendix.

APPENDIX

Hints to grow common vegetables in the Northern Circars

English or local name	Botanical name	Natural order	Month of sowing or planting	Seed rate	Month of harvest	Duration of the crop	Yield	Remarks
Fruit Vegetables								
Brinjal	*Solanum melongena*	Solanaceae	June November February	8 to 12 oz. of the seed sown in 5 cents will give seedlings for one acre	September February May	3½ to 4 months	10,000 lb. 12,000 „ 8,000 „ per acre	Seedlings planted 3′ apart on square in a well-manured rich light loamy soil.
Lady's finger (*bendai*)	*Hibiscus esculentus*	Malvaceae	June November	2 to 2½ lb. of seed for an acre	September February	3 months	6,000 to 8,000 lb. per acre	Seed sown in rows 1½′ apart and 1′ from plant to plant. Picking continues for nearly five weeks.
Tomato	*Lycopersicum esculentum*	Solanaceae	October—November	8 oz. of seed to be sown in five cents plot	January—February	3½ months	8,000 to 10,000 lb. per acre	Seedlings to be transplanted 4′ in rows and 3′ from plant to plant.
Plantain	*Musa paradisiaca*	Musaceae	June or November	800 suckers acre	August or December of the following year	12 to 14 months	700 bunches per acre	Ratooned for two years, and in the third year, the return is by sale of leaves only.
Beans								
Lablab, Garden bean	*Dolichos lablab*	Leguminosae	June	5 to 6 seeds per pit and pits 10 to 12′ apart	November	5 to 6 months	5 to 6,000 lb. per acre	Commonly grown in the back yards of the houses on *pendals* (trellis). There is also a bushy field variety.
Cluster beans	*Cyamopsis psoralioides*	Do.	June October	1 to 1½ lb. per acre	September February	3 to 3½ months	8,000 to 10,000 lb. per acre	Seeds to be sown 2′ apart on square. Grown alone or as an inter-crop with root crops.

Rajula chikkudu	*Dolichos* sp.	Leguminosae	June	5 to 6 seeds per pit and pits 10 to 12′ apart	November	5 to 5½ months	5,000 lb. per acre.	Commonly grown in the back yards of houses, Trailed on old trees and thatched sheds. Only tender seeds are consumed. Very popular in parts of North Vizagapatam.
Golkonda chikkudu	Do.	Do.	Do.	3 to 4 seeds in pits. Pits 8 to 10′ apart	October	4 to 5 months	5,000 to 6,000 lb. per acre	Plants trailed on individual bamboo poles. Very popular in Vizagapatam Dt.
Leafy Vegetables								
Amaranthus *Mokka* or *perugu thotakura*	*Amaranthus gangeticus*	Amaranthaceae	Through-out the year	2 lb. per acre	—	40 to 45 days	Rs. 80 to 100 worth of greens per acre	Greens marketed in summer will fetch higher price. A cent plot will yield a produce of the value of 14 annas to a rupee.
Koyya thotakura	*Amaranthus gangeticus* var. *tristis*	Do.	Do.	Do.	—	40 days	Rs. 50 to 60 worth of greens per acre	A cent plot of the green will fetch annas 8 to 10.
Rega thotakura	*Amaranthus paniculatus*	Do.	June	About ½ lb. of seed to be sown in a nursery of 250 sq. yds. to plant an acre	October	4 months	10,000 to 12,000 plants per acre	Seedlings of 3 weeks' age are to be transplanted 2′ apart either way in the field. Grown only in Vizianagaram taluk. Sold one or two for 3 pies.
Spinach *Mattu batchali*	*Basella rubra*	Chenopodiaceae	June October	8 to 10 oz. per acre	August December	50 days	A rupee worth green from a plot of 1 cent	Broadcasting seed or transplanting of seedlings 1′ apart on square. A very popular green in the Circars.
Pedda batchali	Do.	Do.	June	6 to 8 seeds in pits 10′ to 12′ apart under *pendals* (trellis)	August	50 to 60 days	—	Largely grown in Peddapur and Pithapur taluks. Mostly grown in back yards. Not available in large quantities.

English or local name	Botanical name	Natural order	Month of sowing or planting	Seed rate	Month of harvest	Duration of the crop	Yield	Remarks
Gogu	*Hibiscus cannabinus*	Malvaceae	Throughout the year	8 to 10 lb. of seed per acre	Tender plants ready for harvest after 2½ months	5 to 6 months	One cent plot will fetch greens worth 8 to 10 annas	Sowing in June will yield abundant greens. Sour, Red and *Danasari gogu* are the more common varieties. Very popular greens in the Guntur district. Leaf is preserved with salt to prepare *chutni*.
Root Vegetables								
Elephant yam	*Amorphophallus campanulatus*	Araceae	June November	1,500 to 1,800 lb. of corms per acre	January May	8 months	12,000 to 15,000 lb. per acre	Corms to be planted 1½ to 2′ either way. Acridity depends on the type of soil. *Pati kanda* is considered to be the best.
Colocasia	*Colocasia antiquorum*	Do.	June—July	650 to 750 lb. per acre	December	6 months	2,000 to 2,500 lb. per acre	Tubers to be planted 1½′ either way. Also grows well in shade and wet conditions obtaining in plantain gardens.
Sweet potato	*Ipomoea batatas*	Convolvulaceae	September—October	12,000 sets per acre	January	3½ months	8,000 to 10,000 lb. of tubers and 8,000 lb. of vines per acre	The vines should periodically be pruned and lifted to prevent the formation of small and unmarketable roots. There are two varieties of roots, white and red.
Chara kanda or *Chara chema*	*Colocasia* sp.	Araceae	June—July	1,000 lb. per acre	January	7 months	15,000 to 16,000 lb. per acre	Grown only in parts of North Vizagapatam and Orissa.
Yam—*Pendalam*	*Dioscorea alata*	Dioscoreaceae	June	800 to 1,000 lb. per acre	January to March	8 months	6,000 to 7,000 lb. per acre	Tubers planted 1½′ apart either way. A set of four vines are trailed on a single pole planted at the centre of the four vines.

Yam—*Siragadam*	*Dioscorea esculenta*	Dioscoreaceae	June	1,500 lb. per acre	November continues till February	$6\frac{1}{2}$ months	6,000 to 7,000 lb. per acre	Cultivation similar to *Dioscorea alata*. White skinned tubers are very tasty. Very popular in the Vizag. district.
Gourds								
Ribbed gourd	*Luffa acutangula*	Cucurbitaceae	June January	2 to $2\frac{1}{2}$ lb. per acre. 3 seeds in pits 4′ apart either way; sown broadcast also	October April	4 months	36,000 fruits or 8,000 lb. per acre	Picking continues for two months. Harvest on alternate days and each picking gives on average 1,200 fruits per acre.
Snake gourd	*Tricosanthes anguina*	Do.	June December	3 to 4 seeds in pits 12′ apart either way; 1 to $1\frac{1}{2}$ lb. per acre	November April	4 to $4\frac{1}{2}$ months	A plot of 5 cents yields 800 fruits or 300 to 400 lb.	Picking continues for 1 to $1\frac{1}{2}$ months and in all 15 pickings can be made.
Bitter gourd	*Momordica charantia*	Do.	June October	3 to 4 seeds in pits 12′ apart under *pendals* (trellis)	October February	$3\frac{1}{2}$ to 4 months	—	Not grown on any considerable scale; only near hedges, bunds and such odd places. The white variety is much favoured.
Ash gourd	*Cucurbita pepo*	Do.	June	$\frac{3}{4}$ to 1 lb. per acre; 3 or 4 seeds in pits 12′ apart	November to December	$4\frac{1}{2}$ to 5 months	2,000 to 2,400 fruits per acre	Mostly a rainfed crop. Allowed to spread on ground or on old trees or thatched houses. Very largely grown in the Godavari *lankas* (islands in the river bed of the Godavari).
Bottle gourd	*Lagenaria vulgaris*	Do.	June October	$\frac{1}{2}$ to $\frac{3}{4}$ lb. per acre; 3 or 4 seeds in pits 10′ apart	October February	4 months	3,000 to 5,000 fruits per acre	Grown as a rainfed crop too. Trailed on hay stacks, cattle sheds and allowed to spread on ground. A very paying crop owing to its high yield even under neglected conditions.

English or local name	Botanical name	Natural order	Month of sowing or planting	Seed rate	Month of harvest	Duration of the crop	Yield	Remarks
Pumpkin	*Cucurbita maxima*	Cucurbitaceae	June	1 lb. per acre; 3 to 4 seeds in pits 10 to 12' apart	February	$6\frac{1}{2}$ to 8 months	2,000 to 2,500 fruits per acre	Very largely grown on the *lankas.*
Cucumber	*Cucumis sativus*	Do.	June October	Do.	September February	3 to $3\frac{1}{2}$ months	8,000 to 10,000 fruits or 3,000 to 4,000 lb. per acre	Very popular throughout the Circars. A particular variety locally known as *Mundosa* with short spines on the fruit is grown in parts of North Vizag. Grown in the back yards of houses on *pendals* (trellis).

Acknowledgements I am deeply indebted to Sri T. Nataraj, B. A., B. Sc. (Ag.), Assistant Lecturer in Agriculture, Agricultural College, Coimbatore, for his sympathetic criticism and valuable suggestions on the paper.

SELECTED ARTICLE

The Impact of Science on Agriculture

By SIR JOHN RUSSELL, F. R. S.

In spite of considerable diversity, agricultural systems in the prescientific days usually possessed two features in common; they aimed first and foremost at providing complete subsistence for the community, money crops being a subordinate consideration; and they included measures for conserving the productiveness of the land, either by the so-called fallowing, or by letting the land revert to the wild state, or by some other device. Although these systems had a low level of productiveness they provided food for indefinitely long periods of time, and in addition possessed certain social advantages. In the system followed in Great Britain, around the Baltic, in Northern India and elsewhere, the land was divided into strips which were shared out among the participants for the purposes of ensuring equitable distribution of good and bad land. The whole complex of peasant life developed some creative art which showed itself in a love of colour, folk music and dancing, embroidery, wood carving, pottery, iron work and other peasant arts and crafts.

Unfortunately, the strip system of farming was incapable of improvement by scientific means, and as soon as the peasants insisted on a higher standard of living it had to go. The method of change varied in different countries, Russia adopted one way and Poland another. Instead of scattered strips the agricultural holding was brought into one self-contained unit. Here science was able to play its part. Unfortunately, as science came in so the peasants' arts and crafts, the colour, the singing and the dancing got somehow crowded out; they ceased to be spontaneous peasant activities and are becoming only museum pieces. It would be a great advantage to the country side if, somehow, this apparent antagonism could be overcome.

In Great Britain the change to unified holdings had been made before the scientific era and so we were able at once to introduce science into our agriculture. It led to great improvements and in the 1860's and 1870's our farming superiority was widely admitted. Then came a remarkable sequence of events illustrating the difficulty of anything less than 'total' application of science to agriculture. The prairies of North America were gradually being opened up for settlement. The development of implement design made cereal cultivation possible, while plant selection and breeding—then only in their early stages—provided suitable varieties. Transport and business agencies arranged to take and pay for the produce. A very cheap agricultural system was worked out, and the operations were on so large a scale that considerable economies were possible with the result that wheat was put on British markets at prices below those at which our farmers could grow it. Similar developments occurred in the production of butter, cheese and meat, mitigated somewhat in the latter case by the fact that British produce always had a superior quality and so had some preference in the market. Our farmers could not compete, and British agriculture fell in the 1890's to a very low level. Then a more comprehensive application of science was attempted which was gradually directed to an increase in the output per man-hour, so allowing a higher rate of wage sufficient to keep some of the men on the land. This effort was so far successful that before the War our output per man-hour was higher in money value than in any country in Europe. It proved very difficult, however, to combine this high output per man with high output per acre: indeed there appeared to be some sort of inverse relation between them. Our output per acre was considerably

lower than in the smaller Western European countries of small holdings, and our agriculture remained solvent only by reducing the numbers of paid workers; in England and Wales the fall was from 803,000 in 1925 to 593,000 in 1937-38.

The increased efficiency of the worker rather more than counterbalanced the fall in numbers so that the gross value of the output rose somewhat even after allowing for differences in price.

Meanwhile a striking change had come over large sections of the prairie regions, the development of which had been the cause of so much trouble to British agriculturists. The system of agriculture proved destructive of the soil texture, the original crumb structure broke down, the soil changed to dust and in the high winds blew away. Soil erosion took place on a gigantic scale, and vast areas fell out of cultivation, some never to come back into agricultural use so far as we can see. The United States suffered most and led the way in the search for causes and remedies. It was sown that mixed farming, with alternations of grass and arable husbandry, was the surest way of preventing erosion and the best curative treatment for land not yet ruined beyond repair. But this meant a complete change in the commercial arrangements, and a reversion to the old principles, which included farming for subsistence, and the recognition of responsibility for the conservation of the soil. Far-reaching social changes are likely to result.

A somewhat different problem arose in tropical Africa and parts of India. The climate favoured the production of certain commodities of high commercial value, such as oil, fibre, tea, coffee, etc. The large supply of very cheap native labour ensured cheap production. So a plantation industry was developed and proved highly susceptible to scientific treatment; striking developments occurred. Then, however, arose certain difficulties. These new crops, helped by the aid of science, pushed out the native food crops; the subsistence agriculture gave away before plantation cropping, and the natives received pay for their work but not food. This substitution of money for food led to social difficulties, unrest, malnutrition, etc. Further, a change in the market requirements might render the produce of a whole region more or less superfluous thereby causing great financial loss; the history of sugar-cane in the West Indies is an example. In short, the intense specialization which followed the too exclusive emphasis on efficiency of production had two grave defects; it lacked the permanency of the older system and it did not adequately provide for the needs of the community.

During the past thirty years a great change has come over our ideas of administration, and it is now recognized that subsistence farming must be fully developed so as to ensure abundance of suitable food for the home population. This is necessitating a much broader utilization of science than in the earlier days.

Even in regions of the world where plantation cropping was not practised, the limited scientific intervention first attempted led to unexpected and undesirable results. The efficient medical and veterinary services greatly reduced the incidence of human and animal disease and so curtailed an important check on the population; the numbers of men and of animals increased and put great pressure on the land. The old system of shifting cultivation which had allowed of recuperation of fertility could no longer function; soil deterioration and in many cases soil erosion set in and a crop of troubles—social and technical—arose. These have necessitated great schemes of investigation. The general result is as before the need for a more varied type of farming, making more use of grass and leguminous crops and taking other steps to ensure soil conservation; also a large but better organized production of crops for human and animal food; this of course involves collaboration with the veterinary and the medical staffs so as tc ensure that the right foods are grown.

The War has imposed upon us in Great Britain the necessity for finding some solution of the very difficult technical problem of combining high output per acre with high output per man. The fundamental difficulty is the slowness of agricultural production, which science seems powerless to hasten. In spite of a hundred years of agricultural science crops still take as long to grow as ever they did, further, a lamb still takes five months in getting born and a calf takes nine months or more; all the big vital processes are in the main outside our control. Many of them are very dependent on season. Crops and animals are rarely ready for sale in less than 15 or 18 months after expenditure on them has begun, and as it is impossible to forecast prices for so long farmers are bound to play for 'safety first'. So it comes about that well-recognized improvements cannot be adopted because of the uncertainty whether the prices ultimately obtained will justify them. Probably there is no greater cause of frustration of agricultural science than this uncertainty about price of produce.

In war-time this difficulty disappears and farming is virtually run on contracts like other businesses. Prices and wages are fixed, and farmers know exactly where they are and exactly how far they can go in adopting improved methods. So in spite of almost unparalled difficulties the output per acre now seems to be rising without any corresponding diminution in the output pér man. On all grounds it is essential that British agriculture should continue to function effectively after the War. It will be needed for three purposes: (1) to help in solving the difficult social problems that will certainly arise; standards of population, national nutrition, unemployment, etc. (2) to add to the national wealth and provide food for the community; (3) to remain as an effective protection when next a military adventurer starts a war in Central Europe.

The great need after the War will be for careful planning as to what exactly agriculture in Great Britain is wanted to do. Is it to slacken down considerably to allow of heavy imports of food for the benefit of shipping and commerce, or is it to produce as much as possible? Some sort of compromise will probably be reached. If the imports of food continue to be organized centrally it should be possible to allocate the various items among the different producing countries, giving a certain share to the home farmer at a price which enables him to pay the statutory wages without having continually to reduce the number of workers. So the different problem of combining high output per man with high output per acre can be solved. As an insurance against starvation in the next war it will be imperative to maintain a certain level of agricultural production.

A planned agriculture would allow of the comprehensive application of science, anything short of which may, as we have seen, have unexpectedly bad results. But the planning must not destory the individual initiative that still remains one of the most potent factors of success in agriculture. (*Nature, September 12, 1942.*)

Gleanings

Banana fibre for bags According to Fransico Linares of Cuba banana fibre offers numerous advantages over jute for the making of sugar bags. It is easily obtained from a trunk of high yield, and is manipulated without difficulty. It is stronger than hemp, yet light and silky. It can be obtained immediately in almost any amount and could very well serve as raw material for the production of the bags necessary for the packing of Cuban sugar. (*Int. Sug. J. Jan. 1943.*)

A method of storing sweet potatoes Sweet potatoes can be stored without deterioration for two years or more if they are treated in the following manner. The tubers are dug and then wilted for two or three days. They are next placed in cold water which is brought to the boil and kept boiling for about an hour.

After this, they are removed, cooled, then either sliced lengthways into three or four pieces or else squeezed out as flat as possible with the fingers, and afterwards dried brick hard in the sun. They are then ready for storing. No special storage vessel is needed. When required for use the dried roots are washed and then boiled in the ordinary way. The result is said by natives to be even more palatable than boiled fresh roots.

This recipe is used by the natives of Sukumaland in the Lake Province of Tanganyika, an area which has a very dry atmosphere for a considerable part of the year. It is possible that under more humid conditions the results might be less satisfactory, but there must be many large tracts of East Africa where the method would be worth a trial, particularly in districts where it is necessary to insist on the planting of root crops as a precaution against famine but where cassava (tapioca) is unpopular as a food or agronomically unsuitable. R. B. Allnut. (*E. Afr. Agric. J. Octr. 1942*).

Hints for Bee-keepers

For August

August is perhaps one of the most unfavourable months for bee activity. A meagre supply of pollen is available from *Eupatorium*, zinnia, onion, *ragi*, pumpkin and *cumbu*; and *Antigonon* is the only source from which the bees can collect nectar for their bare subsistence. The strong winds and the lack of pasturage render field activity almost impossible and the little foraging is done only during the short spells of calm weather. The bees have, therefore, to fall back on their reserve food-material. Corresponding to these adverse conditions, breeding is very poor and most of the colonies show a tendency to desert. All possible care should be taken to induce the bees to remain in the hives, by warding off bee enemies, reducing the hive-space, systematic artificial feeding, etc. In addition to these precautions which one has to take during these lean months, the provision of a drone trap, or a piece of queen excluder sheet at the entrance, would minimise the chances of desertion. The opening in these contrivances is about ⅛ inch, and it allows only the workers to pass through, but not the queen, and bees seldom desert without her, though in some stray cases, they kill her and bolt away.

M. C. Cherian & S. Ramachandra Ayyar.

Crop and Trade Reports

Statistics—Crop—Groundnut—1943—Summer and early crops—Condition report Sowings of the summer crop of groundnut are reported to be normal in Cuddapah and above normal in the districts of Chingleput, South Arcot, Chittoor, Tanjore and Madura due mainly to attractive prices for the crop. Sowings of the early crop in Coimbatore are reported to be above normal on account of the promising market conditions.

The summer crop of groundnut is being harvested in parts. The yield per acre is expected to be normal in all districts outside Chingleput and South Arcot where the crop is reported to have been damaged by the cyclone and heavy rains of May 1943. The condition of the early crop of groundnut is generally satisfactory.

The wholesale price of groundnut (shelled) per imperial maund of 82⁶⁄₇ lb. (equivalent to 3,200 tolas) as reported from important market centres on the 3rd July 1943 was Rs. 14—1—0 in Vizianagaram, Rs. 14/- in Adoni, Rs. 13—11—0 in Guntur, Rs. 13—8—0 in Tadpatri, Rs. 13—4—0 in Bellary and Guntakal, Rs. 13—3—0 in Nandyal, Rs. 13—2—0 in Cuddalore, Rs. 13/- in Cuddapah, Vellore and Hindupur, Rs. 12—14—0 in Erode and Rs. 12—11—0 in Salem. When compared with the

prices published in the last report, i. e., those which prevailed on the 10th April 1943, these prices reveal a rise of approximately 29 per cent in Guntakal, 25 per cent in Bellary, 17 per cent in Vizianagaram, 11 per cent in Guntur, 10 per cent in Adoni, 9 per cent in Cuddalore and Salem, 8 per cent in Hindupur, 7 per cent in Tadpatri, 3 per cent in Cuddapah, 2 per cent in Nandyal and 1 per cent in Vellore and Erode. (*Secretary, Board of Revenue—Civil Supplies, Madras*).

Cotton raw, in the Madras Presidency The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February to 2nd July 1943 amounted to 221,796 bales of 400 lb. lint as against an estimate of 406,300 bales of the total crop of 1942-43. The receipts in the corresponding period of the previous year were 329,740 bales. 314,094 bales mainly of pressed cotton were received at spinning mills and 639 bales were exported by sea while 123,308 bales were imported by sea mainly from Karachi and Bombay.

(*Director of Agriculture, Madras*).

Moffusil News and Notes

Agricultural Exhibitions—Jammalamadugu An agricultural exhibition was conducted at Jammalamadugu from the 21st to 23rd May 1943 during the annual Car festival of Sri Narapuraswami temple. Green manure crops and plants and specimen crops of improved strains of important food crops were exhibited. The uses of iron ploughs and bund former were demonstrated. A series of lectures on Grow More Food were made during the festival period.—D. A. O. Cuddapah.

Peruvalapur An agricultural exhibition was held at Peruvalapur in the Lalgudi taluk during the Annual Day Celebrations of the Rural Welfare Association, on the 22nd and 23rd June 1943. Besides improved implements, a collection of different strains of paddy, millets and green manure seeds was on show. Models of cattlesheds and manure pits, a bee hive and its accessories, and pictorial posters on pests and diseases of crops were exhibited. Posters on Grow More Food were put up prominently, Leaflets and other Departmental publications were distributed to the visitors.

Sunaipugazhnallur An agricultural exhibition was held at Sunaipugazhnallur (Lalgudi taluk) on 27th June during the Conference of the Melpattu Village Agricultural Association. Strains of paddy and millets and green manure crops suitable to the tract were exhibited. Pictorial posters on Grow More Food campaign and on improved methods in agriculture were put up prominently. The Agricultural Demonstrator, Lalgudi, addressed the gathering on improved methods of agriculture.—D. A. O. Trichinopoly.

College and Estate News

Students' Corner The first Year B. Sc. and the Short Course in Farm Management classes were formed on the 2nd and 5th July with 48 and 10 students respectively.

Students' Club The first general body meeting of the Students' Club was held on the 8th July with Mr. H. Shiva Rao in the chair. The following office bearers were elected for the year 1943-44.

Club Secretary	... K. R. Narayanaswami
Games „	... G. H. Sankara Reddy
Cricket Captain	... T. Venkataraya Pai
Hockey „	... M. Ramanadhan
Tennis „	... M. Suryanarayana Sastry
Football „	... R. Bettai Gowder

Class Representative III year	...	P. Ammiraju
" " II "	...	K. Narasimhalu
" " I "	...	N. Akkayya.

Lecturer in Agricultural Economics A new post of Lecturer in Agricultural Economics has been sanctioned for the Agricultural College and Mr. K. C. Ramakrishna Ayyar, M.A., lately Lecturer in Economics in the University of Madras, has been appointed to the post. He took charge of the post on the 12th of this month.

A. R. P. Practice There was an A. R. P. practice at the Agricultural College Estate, between 2 and 3 p. m. on Saturday the 24th July 1943. An "incident" was staged in the south-west wing of the Research Institute where a high explosive bomb was "dropped" resulting in 4 "trapped cases" and 20 other "casualities". The A. R. P. personnel of the Estate arrived on the scene and phoned for help. A Heavy Rescue party and First Aid unit of the Coimbatore A. R. P. Division arrived in motor vans and rescued the "trapped cases" which were in the first floor and rendered first aid to the "injured". The more "serious cases" were transported to the Devangapet Hospital in an Ambulance Car and attended to.

Officers' Club The President and Members of the Agricultural College Officers' Club entertained Sri T. S. Ramasubrahmanya Ayyar at a farewell tea on the 24th July. Sri T. S. Ramasubrahmanya Ayyar has availed of leave preparatory to retirement and is leaving Coimbatore shortly to his village.

Departmental Notifications

Gazetted Service—Appointments

Sri C. S. Krishnaswami Ayyar, Assistant in Mycology, is appointed to act as Assistant Mycologist in the temporary post sanctioned for the Scheme of Research for the investigation of Blast and Foot Rot diseases of rice.

Sri G. Seshadri Iyengar, a servant of the Indian Central Cotton Committee, is appointed to act temporarily as Assistant Cotton Specialist, Mungari Cotton Scheme, Adoni.

Sri P. Krishna Rao, on the termination of his appointment as Superintendent, Dry Farming Scheme, Hagari, is reappointed to the M. A. S. as Temporary Development Officer for Dry Farming on the same Station, with effect from 1st July 1943.

Postings

On the expiry of his leave on 8-7-43 Sri P. N. Krishna Ayyar will resume his original post of Assistant Entomologist, Agricultural College, Coimbatore.

Sri C. Jaganatha Rao, Assistant Cotton Specialist, Adoni, is reverted to his substantive appointment and is posted to the Agricultural Research Station, Hagari, as Assistant in Cotton.

Leave

Sri K. Jagannatha Rao, D. A. O. (on leave) extension of l. a. p. for 1 month from 22-6-43.

Sri C. Jaganatha Rao, Offg. Asst. Cotton Specialist, Adoni, l. a. p. for 1 month from 17-7-43.

Sri T. G. Muthuswami Ayyar, D. A. O. (on leave) extension of l. a. p. for 1 month from 1-7-43.

Subordinate Service—Appointment

Sri L. Venkatarathnam, is appinted to officiate as Upper Subordinate, Science section and is posted as Asst. Fruit Section, F. R. S. Kodur, from 1-7-43.

Promotions

The following provisionally substantive promotions are ordered with effect from 27-9-41.

Sri M. Suryanarayana, Asst. in Chemistry, new I Grade to III Grade (old).

Sri S. M. Kalyanarama Ayyar, Asst. in Cotton, IV Grade (old) to new I Grade.

Sri K. Brahmachari, Asst. in Entomology, V Grade (old) to IV Grade (old).

Sri K. P. Anantanarayana Ayyar, Asst. in Entomology, V Grade (old) to IV Grade (old).

Sri M. S. Kylasam, Asst. in Entomology, V Grade (old) to IV Grade (old).

Sri G. K. Chidambara Ayyar, Asst. in Chemistry, V Grade (old) to IV Grade (old).

Transfers

Name of officers	From	To
Sri P. S. Krishnamurthi	Asst. in Entomology, Coimbatore	Entomology & Mycology Asst., Nellore.
,, T. R. Narayanan	Asst. in Plants Physiology, D. F. S. Hagari	Asst. in Millets, Coimbatore.
,, D. Rama Rao	Asst in Millets, Hagari	A. D. Vizagapatam Dt.
,, J. V. V. Surya-narayana	Asst. in Soil Physics, Hagari	Asst. in Chemistry, Siruguppa.
,, N. S. Rajagopala Ayyar	Asst. in Fruit Section, Kodur	A. D. Cheyyar.
,, P. V. Suryaprakasa Rao	Offg. Fieldman, Kodur	Asst. in Fruit Section, Kodur.
,, V. Srinivasan	Asst. in Paddy Section, Coimbatore	Asst. in Pulses, Salem.
,, B. Suryanarayana-murthi	Asst. in Millets, A. R. S. Guntur	Asst. in Pulses, Vizagapatam.
,, P. Seshadri Sarma	Asst. in Millets, D. F. S. Hagari	Asst. in Millets, Dry Farming Development Research, Hagari.
,, C. Bhujanga Rao	Nursery Asst., Kodur	Asst. in Fruits, Kodur.
,, L. Venkatarathnam	Asst. in Fruits, Kodur	Nursery Asst., Kodur.
,, A. H. Subrahmanya Sarma	Marketing Asst. under Grain Purchase Officer, Tanjore	Teaching Asst. in Agri. Coimbatore.
,, V. Mahimai Doss	F. M. Central Farm, Coimbatore	Marketing Asst., Grain Purchase Officer, Tanjore.
,, P. Narayanan Nayar	F. M. A. R. S. Taliparamba	F. M. A. R. S. Nanjanad.
,, K. Parameswara Menon	F. M. A. R. S. Nanjanad	A. D. Malabar Dt.
,, T. V. Krishnaswami Rao	A. D. Jami	A. D. Chicacole
,, R. Anantapadma-nabha Pillai	Hosur Cattle Farm, Hosur	F. M. Vegetable cultivation, Hosur Farm.
,, S. Muthuswami	F. M. Vegetable cultivation, Hosur Farm	Hosur Cattle Farm, Hosur

Leave

Name of officers	Period of leave
Sri P. Vishnusomayajulu, Asst. in Mycology, Coimbatore	L. a. p. on m. c. for 8 months from 25-6-43.
„ D. Bapiah, F. M. A. R. S Guntur	L. a. p. on m. c. for 3 months from 11-6-43.
„ I. Kruma Rao, A. D. Vuyyur	L. a. p. for 1 month from 1-7-43.
„ P. S. Krishnamurthi, Asst. in Entomology, Coimbatore	L. a. p. for 2 months from 19-7-43.
„ P. Narayanan Nair, F. M. A. R. S. Taliparamba	L. a. p. for 1 month from 14-7-43.
„ M. Narayana Ayyar, A. D. Hosur	L. a. p. for 2 months from 22-7-43.
„ G. Sakharama Rao A. D. Karakal	L. a. p. for 1 month from 15-7-43.

SN. 9. BRITAIN'S PRIME MINISTER REAFFIRMS HIS FAITH IN AN ALLIED VICTORY

Mr. Winston Churchill, Prime Minister of Britain, caught by the camera in a typical pose. Picture was taken during a visit to war factory workers in Britain.

The Madras Agricultural Journal

(ORGAN OF THE M. A. S. UNION)

Vol. XXXI | AUGUST 1943 | No. 8.

EDITORIAL

India's Cattle Wealth "Cattle are, in a real sense, the basis of India's economy and the deep and traditional reverence paid to them by so many millions throughout the country has a very real and solid basis" said His Excellency the Viceroy at the annual General Meeting of the All-India Cattle Show Society held at New Delhi recently. Thanks to the deep personal interest evinced by H. E. Lord Linlithgow, the question of improvement of livestock received an impetus in recent years and considerable progress has been attained in many directions relating to the welfare of farm animals The importance of pedigree in cattle and the necessity for the maintenance of pure-bred stock have been realised ; the great possibilities of cattle breeding have been brought home to the cultivator ; increasing attention is being paid by Provincial Governments and the Imperial Council of Agricultural Research to questions affecting animal husbandry and organisations like the All-India Cattle Show Society are doing valuable work in the form of propaganda. It must be admitted, however, that these efforts and achievements thereon, though not insignificant have not made a deep impression on the country as a whole, and have but touched the fringe of the problem. The interruption of the steady progress of this valuable work on account of War, though inevitable, is to be deplored. The diversion of the energies of the nation towards matters of more immediate importance, viz , the winning of the war, should not make one forget that when war is over one of the immediate problems to be tackled in India is the rehabilitation of the livestock industry on a rational and economic basis. For, as H. E. the Viceroy remarked, the agricultural prosperity of this land is closely interlinked with its livestock and the neglect of the latter will inevitably lead to adverse repercussions on the former.

The small farmer to-day is faced with serious difficulties with regard to his cattle Considerable number of work animals have been drawn away from the farm. The reduction in the area grown to fodder owing to more land being devoted to money crops, the high level of prices prevailing for feeding stuffs and the difficulties in transport have all rendered it exceedingly difficult for him to provide adequate rations for his draught and milch animals and maintain them at a proper level of efficiency with the result

that he is in the grip of a vicious circle of poor out-turn in his lands and the selling away of his half famished cattle to the slaughter house.

The first concern of the Government in post-war reconstruction should, therefore, be the replenishment of Indian livestock with high pedigree animals suited to the varying needs of the country. In this connection His Excellency the Viceroy mentioned the possibilities of large scale artificial insemination of livestock with a view to establishing a valued breed in a short space of time. While the possibilities should not be left unexplored, we would like to utter a note of warning at the risk of being dubbed reactionary. In India, the ox, and to some extent the buffalo, is not a single purpose animal not even a dual purpose one. With the exception of certain special breeds as for example the Sindhi, the Indian animal in most parts of the country is an all purpose one. It can be used as a draught animal on the farm and on the road and also as a milch and beef animal, *albeit* on a low level of efficiency compared to the dual or single purpose animals specially bred for the purpose. Experts have not agreed whether it is more economical to have animals bred for different purposes or to have all the attributes blended in one breed, which will, of course, be not an easy task and attainable in the near future. In our opinion, the Indian peasant would prefer to have an all purpose animal and it will be wisdom to respect his prejudices in the absence of an agreed view on the subject by the experts. The mistakes made in earlier years of ignoring his point of view in cattle breeding have resulted in waste of effort and, we hope, that the experience gained in the past will be made use of in planning for the future.

Manuring successive crops of rice with ammonium sulphate and super phosphate

By ANANDAN,
District Agricultural Officer, Tanjore
V. KRISHNASWAMY & V. SRINIVASAN,
Assistants, Agricultural Research Station, Aduturai (Tanjore District)

Introduction In the Tanjore delta which has nearly a million acres under irrigated rice, the rice growers are in the habit of applying ammonium sulphate to their rice crop without the addition of any organic matter. This was particularly so during the post war boom period of 1919—1929, when paddy was selling at Rs. 3 to Rs. 3—12—0 a kalam of 64 lb. Later on there were complaints that the yields of rice crop declined in fields that received ammonium sulphate. Invariably such statements were made by persons who applied a bag (80 lb.) of ammonium sulphate to one crop and stopped applying it to the following crop. It might be that the reduction in yield was the result of discontinuance of manuring. There was also no experimental evidence to declare that continued application of an artificial manure like ammonium sulphate really brought down the yield of rice. With a view to find out the effect of continued applications of ammonium sulphate on the rice crop, the following experiment was designed and conducted at the Agricultural Research Station, Aduturai in the Tanjore district for a period of five years from 1935-36 to 1940-41.

Soil and cropping season The soil on the station, is typical alluvial clay of the Cauvery delta which cracks heavily in summer months and sticks badly when wet. It is well supplied with potash but is deficient in nitrogen and phosphoric acid (Harrison and Raghunathaswami Ayyangar). The cultivation season commences by the middle of June, with the receipt of water in the channels fed by the river Cauvery. The first crop which has a short duration of 3 to 3½ months occupies the ground from July to the end of September. The second crop, which is generally a long duration variety of five to six months is planted by the middle of October after the harvest of the first crop, and harvested by the middle of February.

The field where the experiment was conducted had two crops every year. In years previous to the starting of the experiment it received green leaves and bonemeal at 2,000 lb. and 200 lb. per acre respectively at the time of planting, and ammonium sulphate at 50 lb. per acre, fifteen days after planting as a top dressing.

Design of the experiment During the second crop season of 1935 an area measuring 45 cents was selected and laid out into six blocks. Nine manurial treatments mentioned below were tried on each block. In succeeding years and to each succeeding crop the same manures were applied to each plot to the same degree. This experiment was discontinued after taking ten crops in five years. Each experimental plot measured 14 ft. × 20 ft.

giving an area of half a cent. The seedlings were planted in singles spaced 6 in. either way. At harvest one border row of plants, was rejected all round and only the plants inside the plots were used for deriving the yields of individual plots. Each plot had 1053 plants. The manurial treatments were—

A—No manure
B—20 lb. nitrogen per acre
C—30 lb. » »
D—20 lb. phosphoric acid per acre
E—30 lb. » » »
F—20 lb. nitrogen and 20 lb. phosphoric acid per acre
G—20 lb. » and 30 lb. » » »
H—30 lb. » and 20 lb. » » »
I— 30 lb. » and 30 lb. » » »

Application of the manure Ammonium sulphate was the manure used to supply nitrogen and concentrated super phosphate was chosen to supply phosphoric acid in all years except in 1939-40 when ordinary super phosphate was used. The requisite quantities of manure were well mixed with an equal quantity of sand to increase the bulk to facilitate uniform distribution and they were sprinkled evenly over each plot just after the final levelling.

The accurate spacing of the seedlings 6 in. × 6 in. in the field was secured by planting them against bold tar markings spaced 6 in. apart on straight bamboo sticks.

The seedlings for the first crop were grown under semi-dry conditions and those for the second crop were invariably raised in wet nurseries according to the local practice. The results obtained in each year from the first and second crops are shown separately below.

TABLE I Percentage increases over control (No manure)

(a) First crop

Years	Treatments									Variety	Duration
	A	B	C	D	E	F	G	H	I		
1936-37	100·0	106·0	116·7	100·2	103·7	116·7	121·7	124·2	125·2	Adt. 12	107
1937-38	100·0	119·9	130·9	105·6	108·7	129·3	130·1	142·1	148·4	3	95
1938-39	100·0	109·4	129·0	114·2	121·0	132·4	133·1	143·9	136·5	9	115
1939-40	100·0	113·3	115·3	110·0	116·0	125·3	124·7	124·0	123·3	12	107
1940-41	100·0	125·5	134·2	111·0	113·0	130·7	130·3	136·6	142·6	4	100
Mean	100·0	114·8	125·2	108·2	112·5	126·9	128·0	134·2	135·2		

(b) Second crop

Years	A	B	C	D	E	F	G	H	I	Variety	Duration
1935-36	100·0	135·2	149·7	106·1	106·8	133·7	134·5	148·9	149·7	Adt. 2	165
1936-37	100·0	116·7	127·5	103·5	103·5	123·5	126·4	134·7	132·6	2	165
1937-38	100·0	125·3	148·1	102·5	115·5	135·5	135·5	150·6	149·4	11	175
1938-39	100·0	108·2	114·4	107·2	106·2	114·4	115·4	113·4	113·4	8	150
1939-40	100·0	129·2	140·0	103·1	106·2	136·9	136·9	152·3	152·3	8	150
Mean	100·0	122·9	135·9	104·9	107·6	128·8	129·7	140·0	139·5		

In all the years 'Z' test was satisfied. The conclusions obtained each year for the two crops are given below.

First crop		Second crop	
1936–37	I H G F C B E D A	1935–36	C I H B G F E D A
1937–38	I H C G F B E D A	1936–37	H I C G F B D E A
1938–39	H I G F C E D B A	1937–38	H I C F G B E D A
1939–40	F G H I E C B D A	1938–39	G F C H I B D E A
1940–41	I H G F B C E D A	1939–40	H I C G F B E D A

The following conclusions can be drawn from them :—

(a) The average figures for increases show that the application of nitrogen in the form of ammonium sulphate has given both in the first and second crops much bigger increases in yield than the application of phosphoric acid, either in the shape of concentrated or ordinary superphosphate (treatment B & C versus D & E).

(b) Generally speaking, 30 lb. of nitrogen in combination with 20 lb. of phosphoric acid (treatment H) has given about 10 % extra yield over 20 lb. N plus 20 lb. of phosphoric acid (treatment F), but the addition of an extra dose of 10 lb. of phosphoric acid over 20 lb. of phosphoric acid does not seem to have improved the yield in any way (treatment G versus F).

(c) Increases in yield are noticed in all the years of the experiment invalidating the statement that ammonium sulphate does not give increased yields from crops after a year or two.

(d) Continuous application of manures has not produced appreciable cumulative effects in crops of both seasons.

The economic aspect of this system of manuring may now be considered. The following table gives ihe figures of acreage yield, net increase in yield of grain over control, cost of manure and the profit per acre from the different treatments.

TABLE II

(a) First crop

Years	Acre yield in lb.								
	Treatments								
	A	B	C	D	E	F	G	H	I
1936–37	2600	2756	3034	2608	2699	3034	3163	3228	3279
1937–38	2217	2671	2906	2347	2417	2879	2897	3161	3306
1938–39	2596	2842	3351	2965	3133	3439	3456	3737	3544
1939–40	2653	2997	3052	2918	3071	3315	3309	3282	3265
1940–41	2176	2724	2921	2416	2459	2843	2900	2973	3102
Average	2448	2798	3053	2651	2756	3102	3145	3276	3299

(b) Second crop

1935-36	1712	2316	2560	1816	1829	2288	2301	2549	2560
1936-37	1872	2183	2380	1934	1934	2308	2362	2518	2479
1937-38	1386	1747	2056	1429	1617	1888	1886	2103	2088
1938-39	1702	1842	1947	1824	1807	1947	1964	1930	1930
1939-40	1144	1491	1609	1182	1215	1571	1571	1756	1756
Average	1563	1916	2110	1637	1680	2000	2017	2171	2163

TABLE III Statement showing the average increase in yield, cost of manuring and the net profit obtained per acre

	B	C	D	E	F	G	H	I
First crop								
Average increase over no manure per acre	lb. 350	lb. 605	lb. 202	lb. 308	lb. 654	lb. 697	lb. 828	lb. 851
Average value of increased produce	Rs. A. 10-14	Rs. A. 18—4	Rs. A. 6—6	Rs. A. 9—8	Rs. A. 19-11	Rs. A. 20-14	Rs. A. 24—9	Rs. A. 25—5
Average cost of manuring per acre	5—7	18—2	3—6	5—1	8-12	10—7	11—8	13—2
Net profit over control	5—7	10-—2	3—0	4—7	10-15	10—7	13—1	12—3
Second crop								
Average increase over no manure per acre	lb. 353	lb. 547	lb. 74	lb. 117	lb. 437	lb. 454	lb. 608	lb. 599
Average value of increased produce	Rs. A. 11--2	Rs. A. 17—3	Rs. A. 2—5	Rs. A. 4—7	Rs. A. 13-13	Rs. A. 14—5	Rs. A. 19—2	Rs. A. 18-14
Average cost of manuring per acre	5—3	7-13	2-11	4—1	7-15	9—5	10—9	11-14
Net profit over control	5-15	9—6	0—6	0—6	5-14	5—0	8—9	7—0

Data for calculating the profit and loss account

		35-36	36-37	37-38	38-39	39-40	40-41
Cost of ammonium sulphate per lb.	Rs.	0—0—9	0—0-10	0—0—9	0—0-11	0—0-11	0—0-11
Cost of concentrated super phosphate	Rs.	0—0—9	0—0-11	0—0—9	0—1—0	—	0—1—7
Cost of ordinary super phosphate	Rs.	—	—	—	—	0—0—5	—
Sale price of paddy kuruvai per 64 lb.	Rs.	—	1—6—0	1-10—0	1-14—0	2—0—0	2—8—0
Do. samba ,,	Rs.	—	1-14—0	—	—	—	—
Do. sirumani ,,	Rs.	2—0—0	1-12--0	—	2—4—0	2—6--0	—

Conclusions The figures given above bring to light the following:—

(a) The first crop is more responsive to manuring with the above manures than the second crop, the maximum increase in yield of grain due to manuring being of the order of 850 lb. an acre as against 600 lb. in case of the second crop.

(b) From the economic point of view it is clear that it is worthwhile manuring both the first and second crops and realising a profit of Rs. 10 to Rs. 13 an acre.

(c) It is not remunerative to manure the second crop with super-phosphate only.

(d) The most remunerative dosage is 30 lb. of nitrogen plus 20 lb. of phosphoric acid per acre. 30 lb. nitrogen also gives almost the same

yield but it is not advisable to supply nitrogen only, especially on soils as of Tanjore delta which are very deficient in phosphoric acid.

(e) For the second crop, application of ammonium sulphate to supply 30 lb. nitrogen per acre alone seems to be profitable but it is preferable to add 20 lb. of P_2O_5 to keep the soil well stocked with this valuable plant food.

Literature cited.

Harrison, W. H. and Raghunathaswami Ayyangar, P. A. (1914) A soil survey of the Tanjore delta, *Madras Dept. Agric. Bul.* 68.

Economies in Feeding Cattle

By V. T. SUBBIAH MUDALIAR

The prices of commodities have risen considerably of late, particularly during the last twelve months. In certain cases the rise is phenomenal, so phenomenal as to be almost incredible. The rise in prices is also general and all classes of commodities are affected to a greater or lesser degree. Neither the rise in prices nor the factors conducive to such rises are in the control of individuals, but wise and judicious spending is in the hands of the discriminating people. It is becoming increasingly important to be extremely circumspect in choosing the right type and quantity of the various commodities for purchase. This choice is the problem today that confronts people with limited incomes, including agriculturists.

Cattle feeds are registering unprecedentedly high price levels, in common with other articles. Many of the common and usual feeds are getting scarce and costly. These may be the result of restricted transport facilities or of diversion of productive activity to more profitable fields or diversion of commodities for other and new uses. Early in 1940, the market for groundnut was cut off by the war and the farmers had in their hands large stocks of groundnut. Other crops could not satisfactorily replace groundnut in the prevailing system of cultivation. The same war has since come to the rescue. The conditions created by it found new uses for groundnut—kernels, oil and cake. The high prices of agricultural produce stimulated the use of manures for paddy and other crops. The import of fertilisers dwindled and people turned to groundnut cake for manuring the fields to a greater degree. The high prices of produce made manuring, even with costly manures, an economic proposition and certainly not uncertain as heretofore. Groundnut cake was selling at about Rs. 30 a ton early in 1940, at Rs. 60 in 1942 and is now at about Rs. 150 a ton. The peasants who maintain cattle find it increasingly difficult to feed the animals with concentrated feeds at the present high prices. The prices of other feeding stuffs also are on the upward trend. Cotton seed, sold at about Rs. 60 a ton early in 1942, is now selling at Rs. 240 a ton. One of the problems of the day for the cultivator is the feeding of his animals with concentrates. Is he to continue to feed his animals with concentrates priced so high and would it pay? Or alternatively is he to stop feeding

concentrates and allow his animals to lose condition, fall down in draught capacity and give a diminshed milk supply from cows? Obviously he cannot afford the one or the other. The solution that naturally suggests itself is that the peasant substitues the purchased feedstuffs by home grown material, as far as possible and they are not so costly. The feeding stuffs grown in the farm will automatically reduce the area under other crops, apparently more remunerative. But the area that is required for the growing of the feed stuffs is only limited and the loss of other produce from this area is not likely to be greater than the cost of the concentrates that have to be purchased in the open market.

Concentrated feeds aim at supplying animals with fats and proteins. The fats and carbohydrates in feed are interconvertible in the animal system and a deficiency of one can be made up by the other within limits. At the same time it must be remembered that the composite feed must have a certain amount of fat. Normally provision has to be made for an average supply of 4 per cent of fat in the composite feed for the milch animals.

Proteins supply nitrogen for the metabolism in the animal system and proteins have necessarily to be supplied to the fullest extent. The deficiency of proteins in the feed could not be made up by other ingredients in the feed and there are no short cuts as far as protein feeding is concerned. Protein also happens to be the costliest nutrient in animal feed. Attempts have therefore to be made to grow protein-rich feed in the farm itself with the object of cutting out the purchase of protein feed. There are a number of crops that give protein-rich produce and the leguminous plants take priority among them, with the capacity to assimilate atmospheric nitrogen and fix it in their tissues—capacity not usually possessed by other plants. The crop chosen should preferably be capable of growing luxuriantly and giving a large produce.

Lucerne and sweet potato crops are suggested as being suitable for this country, for supplying protein feed for the farm animals. Both are rank growers giving a good tonnage of fodder and contain good quantities of protein.

Lucerne is a leguminous crop that stands repeated cuttings throughout the year. It makes rapid growth, particularly during the cold weather and is capable of giving upto 60,000 lb. of green fodder per acre annually. A moderate crop would give 40,000 lb. of green feed, equal to 10,000 lb. of hay, having a protein equivalent of 4,000 lb. of groundnut cake or of 12,000 lb. of cotton seed; $2\frac{1}{2}$ lb. of lucerne hay supplies as much protein as 1 lb. of groundnut cake. Lucerne hay can largely replace groundnut cake, but it is not desirable to cut out the cake altogether. Lucerne hay can be safely given to cattle upto a maximum of 10 lb. a day. As a precautionary measure, lucerne hay may be fed however at 2 lb. per day per animal to start with and increased gradually. Green lucerne may also be given to animals, but large quantities are apt to promote tympanny and the hay is comparatively a safer feed, especially at the higher levels, where lucerne meets the major part of the protein requirements of animals.

Sweet potato is a common tuber crop. It makes vigorous growth. The young vines are succulent and contain 2·58 % of proteins, equivalent to 19 % on a dry basis. 20 lb. of green vines a day would supply as much protein as one lb. of groundnut cake or 3 lb. of cotton seed. The vines have a tendency to loosen the bowels of animals, when fed in large quantities and could not therefore replace the concentrates entirely. The vines are good green feed, apart from the protein value, and the inclusion of sweet potato vine in the dietary of cattle is an advantage.

Dairy animals at the Agricultural College, Coimbatore are fed with sweet potato vines up to 50 lb. a day especially in summer, when other green feeds are scarce. Even such large quantities do not produce any ill effects on the animals. The vines are relished by cattle and are eaten greedily.

Sweet potato vines could be cut two months after planting and three cuttings could be had by the time the crop is six months old. Fifty to sixty thousand pounds of green vines could be had during this period, from an acre, i. e., the protein equivalent of 2,500 to 3,000 lb. of groundnut cake or 8,000 lb. of cotton seed. The crop would also give 6000 to 8,000 lb. of poor quality tubers, which may be boiled and fed to cattle. Two crops could be grown in an year, one following the other.

Lucerne and sweet potato are only two of the possible substitutes for the concentrates. Most of the leguminous hays are valuable cattle feed. It may be possible to introduce a short duration legume hay crop as an addition in the existing system of cultivation. The Circars ryot is growing a hay crop of Sunhemp in summer in the wetlands, utilising the moisture in the soil. Something similar may be possible in the other localities. A little preliminary planning and suitable modifications in the existing system of cultivation is all that is necessary for solving the problem for the individuals. The analysis of some of the common feeding stuffs given under might possibly be suggestive.

Name of material	Analysis on original moisture basis				Analysis on a dry basis		
	Original moisture	Crude protein	Fat	Carbo-hydrates	Crude protein	Fat	Carbo-hydrates
Cotton seed	10·00	16·22	18·53	27·88	18 02	20·60	30·98
Groundnut cake	12·50	46·31	7·19	23·57	51·75	8 22	26·94
Gingelly cake	12·50	40·51	8 67	24·37	46·30	9 91	27·85
Babul pods	10 00	14·19	0 79	58·97	15 77	0·88	65 52
Lucerne hay	10·00	19·13	1·27	31·66	21·26	1·41	35·18
Green lucerne	80·00	4 46	0·30	10·06	22·30	1·50	50·31
Sweet potato vines	86·42	2 58	0 32	4·65	19 00	2·36	33 93
Sunhemp hay	10·00	13 39	1·04	29 89	14·88	1·16	33·21
Groundnut haulms	10·00	9 66	0·79	29·17	10·73	0·88	32·41
Agathi leaves	75·00	8·89	0 56	11·75	33·56	2·23	47·00

Would the progressive farmers try these suggestions and induce their neighbours to do likewise? This will effectively meet the challenge of the present high prices of feeding materials.

A note on the cultivation of maize for cobs

By A. SANKARAM, B. Sc. Ag.

Maize is primarily a grain crop grown extensively all over the world. In the Northern Circars, it is grown mainly as a fodder crop. Of late however, it is being cultivated for its green cobs, especially near towns. The local people have cultivated a taste for the green cobs and there is a steady, though limited, demand for the cobs in the market. The area devoted to the cob-crop is not negligible, being about 100 acres even about the neighbourhood of a small town like Anakapalli. After the removal of the cobs, the stalks are cut and fed to cattle. They are particularly valuable for the milch cattle. The maize cob-crop is cultivated in the Circars as follows.

Soil Maize comes up well in almost all classes of soils, and paticularly well in good loamy soils. It is also grown in clayey loams in wetlands that have supplemental irrigation facilities from wells, provided the soil is well drained.

Rotation Maize is grown in rotation with brinjals and *bhendai* in garden lands. It follows onions or *Pyru* gingelly in wetlands. It is grown mixed with red gram in dry lands. Occasionally maize and brinjals are broadcasted together as a mixture. After the harvest of maize, the brinjals left behind are manured heavily. Sometimes sunhemp is broadcasted in the standing maize, when it is about six weeks old. After the harvest of maize, the sunhemp is ploughed in as green manure.

Preparatory Cultivation Maize responds to good cultivation and manuring. A good tilth is secured by ploughing the land repeatedly—6 to 8 times—with a wooden plough. Well-rotted cattle manure is applied to the land at 15 cart-loads per acre and this is supplemented by penning 2,000 sheep. Ten cart-loads of wild indigo leaf are also applied in addition to cattle and sheep manure, when it is proposed to take a crop of brinjals after maize in garden lands.

Season The sowings are made from March onwards, under well irrigation. In dry lands, the sowings are done with the South-West monsoon showers in June. Sowings are done periodically, in batches, to facilitate the tender cobs being put in the market continuously from June to October. Maize is not raised during the cold weather, as the cob formation and filling are then defective.

Seed and Sowing Good sized and well filled cobs are left to mature on the plant. The cobs are harvested, dried in the sun and shelled. The seeds are stored in tins or mudpots, with a layer of ashes at the top. The mudpot is covered with a cloth and sealed with mud and cowdung plaster to prevent damage by pests of stored seed.

Broadcast sowing is the usual practice. The seed rate is 10 lb. to the acre. The cobs are not good sized, if a higher seedrate is adopted. The seeds are also dibbled in the plough furrows, sometimes. After the seeds are covered, beds 8 ft. × 8 ft. are formed with irrigation channels in between every two rows of beds. In mixed crop sowing, red gram is first broadcasted and maize is dibbled in the plough furrows, using 2 lb. of red gram seed and 8 lb. of maize to the acre. Red gram and maize are also sown in lines with *akkadi*, with one line of red gram for every three lines of maize.

Irrigation Early crops sown in March and April are given about five irrigations. Crops sown in June come up with three irrigations. In North Vizagapatam, where the South-west monsoon is heavy, dry crops of maize are raised.

After cultivation After the sprouts appear, the gaps are filled by dibbling and hand-watered. Weeding is done 20 days after sowing, when the crop is 6 to 8 inches high, followed by a hoeing and thinning, a week after. The third weeding is after another fortnight. Birds which damage the cobs, are scared by boys by tapping empty kerosene tins with small sticks. Night watch is provided, where the crop is subject to damage by jackals.

Harvest The duration of the crop is 100 to 120 days. Tender cobs begin to form from the sixth week after sowing and are ready in another two weeks. The tender cobs are relished by most of the people, but the labouring class prefers the mature cobs, as being more sustaining. As the crop is sown in batches one after the other, the harvest is done in stages, as the cobs get ready. The *ryots* arrange their sowings so that they may have 2 to 3 cents of the crop ready for the daily harvests during the season, and this is managed without any additional labour being engaged for the purpose. Each plant gives one cob, while a few bear two cobs and some are infructuous. The early crops give about 13,000 cobs from an acre and the main season crops give about 14,000 cobs. After the harvest of the cobs, the entire crop is cut and fed to cattle. 3,000 to 4,000 lb. of green feed is had from an acre.

Marketing The tender cobs become available from June onwards; the peak supplies are from July to September and there is a good demand for the green cobs in the local market. The *ryots* either sell the standing crop at Rs. 50 to Rs. 70 per acre or attend to the harvest and sell the green cobs to the dealers at Rs. 3—12—0 to Rs. 5—8—0 per thousand cobs. The cobs are retailed at 12 annas to a rupee per hundred, i. e , at Rs. 7—8—0 to Rs. 10 per thousand. The returns are disproportionately shared by the grower and the merchant, each receiving about 50% of the prices realised.

The roasted tender cobs is a common favourite with all classes of people. The cobs obtained from the dry crops are said to be better than the others. Though the cobs are tasty and appetising, they are not easily digested by people accustomed to a soft rice diet.

The Economics of cultivation The cost of cultivation and the profits that may be expected normally are given below :—

Items of cultivation	Early crop (April) Rs.	As.	Ps.	Late crop (June) Rs.	As.	Ps.	Dry Crop (June) Rs.	As.	Ps.
Preparatory cultivation ...	8	0	0	8	0	0	8	0	0
Manures and manuring ...	15	0	0	15	0	0	5	0	0*
Seeds and sowing	1	0	0	1	0	0	1	0	0
After cultivation	3	4	0	3	4	0	3	4	0
Irrigation	12	8	0	7	8	0			
Harvest	2	8	0	2	8	0	2	8	0
Assessment, scaring birds, etc. ...	2	12	0	2	12	0	2	4	0
Total cost of cultivation per acre	45	0	0	40	0	0	22	0	0
YIELD									
Marketable cobs per acre ...	13,000			14,000			10,000		
Value per thousand cobs ...	5	8	0	4	8	0	4	8	0
Total value of cobs ...	71	8	0	63	0	0	45	0	0
Fodder produced in lb. ...	3,500			4,000			3,000		
Value of fodder	5	4	0	6	0	0	4	8	0
Total receipts per acre ...	76	12	0	69	0	0	49	8	0
Net profit ,, ,, ...	31	12	0	29	0	0	27	8	0

* Sheep are penned in the dry lands and no cattle manure is applied normally.

Conclusion The area devoted to this crop by individual *ryots* ranges from 50 cents to 1½ acres. Maize grown for cobs is a short duration remunerative crop, requiring only a small investment. Hence the cultivation of maize for the green cobs can be advantageously taken up in localities adjoining towns.

The Madras Agricultural Students' Union

Annual general body meeting 1943.

The annual general body meeting of the Madras Agricultural Students' Union was held on Friday 30th July 1943, at 6 P. M. in the Freeman Hall with Mr. N. L. Dutt, the Vice president, in the chair. Fifty four members including thirty two student members were present. The minutes of the previous general body meeting were read and adopted. The Secretary then read the report of the Managing Committee for the year 1942-43, which was adopted unanimously. The report of the auditors in respect of the accounts for the year 1942—43 and the draft budget for the year 1943-44 were then taken up for consideration. Proposed by Sri Rao Bahadur V. Ramanatha Ayyar and seconded by Sri C. S. Krishnaswami Ayyar (Mycology) it was resolved that the excess expenditure over the sanctioned budget estimates of last year incurred by the Committee, may be ratified, in view of the abnormal conditions created by war. It was then suggested that this matter should form one of the subjects to be included in the Managing Committee report. As regards Rs. 100 tender deposit shown in the balance sheet, under funds and liabilities, the Committee were requested to refer the same to the auditors with the concerned voucher for necessary modification in the balance sheet. Sri Rao Bahadur V. Ramanatha Ayyar, proposed and Sri C. S. Krishnaswami Ayyar (Mycology) seconded, that the College Day and Sports be held during the year 1943-44 and a sum of Rs. 250 be provided under

expenditure for the same as against an estimated receipt of Rs. 200 by donations from members'. This was adopted by the general body with acclamation.

The President then announced that the Ramasastrulu Munagala prize was awarded to Sri P. A. Srinivasan, student B. Sc. Ag., III for his essay on "An Economic Survey of the Marketing of Tobacco at Palghat".

The election of office-bearers for the year 1943-44 was then proceeded with. The Vice-President announced the names of those who were elected to the offices of Vice-President, Editor and Secretary by ballot, as follows:—

Vice-President :—	Sri C. Ramaswami Nayudu.
Editor :—	Sri C. R. Srinivasa Ayyangar.
Secretary :—	Sri K. Ramaswami.

The following office bearers were then elected (duly proposed and seconded). *The council:* Mofussil Vice-Presidents:—Sri R. Swami Rao, Sri M. Kantiraj, and Sri M. Anandan.

Mofussil members:—Sri M. Narasimham, Sri M. Royappa Pillai, Sri M. R. Balakrishnan and Sri M. Kalimuthu.

Resident members:—Dewan Bahadur Sir T. S. Venkatraman, Sri Rao Bahadur G. N. Rangaswami Ayyangar, Rao Sahib V. Muthuswami Ayyar, and Sri E. R. Chellam Vincent.

Managing Committee:—

Manager:—	Sri C. Balasubramaniam.
Treasurer:—	Sri C. S. Krishnaswami (Agricultural Section).

Other members:—Sri A. Mariakulandai, Sri M. M. Krishna Marar, Sri S. V. Duraiswami Ayyar and Janab Ibrahim Ali Sahib (Student).

Editorial Board:—Sri C. M. John, Sri V. T. Subbiah Mudaliar, Sri Rao Bahadur V. Ramanatha Ayyar and Sri P. A. Srinivasan (student).

After the vote of thanks proposed by Sri Rao Bahadur V. Ramanatha Ayyar to the retiring committee, the meeting terminated.

General body meeting of the resident members.

Sri C. R. Srinivasa Ayyangar and Sri K. Ramaswami, who were elected as Editor and Secretary respectively, at the last annual general body meeting expressed with regret their inability to accept the offices. A general body meeting of the resident members was therefore convened on 12th August with the Principal in the chair. Sri V. T. Subbiah Mudaliar and Sri N. Muthuswami Naidu were elected as Editor and Secretary respectively. In the vacancy caused by the election of V. T. Subbiah Mudaliar as Editor, Sri T. Nataraj was elected as a member of the Editorial Board.

Report of the Managing Committee of the Madras Agricultural Students' Union for the year 1942-43

The Managing Committee of the Union beg leave to present the following report of the activities of the Union for the period 1st June 1942 to 31st May 1943.

Membership The number of members on the roll on 31st May 1943 was 515 as against 512 in 1942 and 496 in 1941. Though there has been a slight increase in membership, a large number of officers of the department and ex-students of the college are still not members.

Office bearers The Principal Mr. P. V. Ramiah continued to be the ex-officio-President throughout except for a period of six weeks when he was appointed acting Director of Agriculture. During this period Mr. C. R. Srinivasa Ayyangar was the Principal and the President.

College Day and Conference for 1942 Owing to conditions created by war and the absence of deputation of district officers, it was decided to postpone the holding of the College Day and Conference for the year 1942, till circumstances are favourable for the holding of the same. The College Day Sports, however, were held on Saturday, 30th January 1943. The function was a great success and in four events new records were set up. Our thanks are due to Mrs. C. R. Srinivasa Ayyangar who very kindly gave away the prizes. Thanks are also due to Sri A. Mariakulandai and other members of the sports committee for their active co-operation in arranging and conducting the sports. As regards the College Day and Conference of 1943 we regret that it has once again not been possible to hold the same.

Managing committee meetings Eleven meetings of the Committee were held during the year.

Editorial Board meetings There were 14 meetings of the Board. Our thanks are due to Sri C. M. John, Editor and the members of the Board for the efficient conduct of the journal during difficult times.

The Madras Agricultural Journal Owing to increased cost of printing and the difficulty of obtaining paper of the requisite quality, the committee were constrained to reduce the number of pages of the journal to about 30 pages of reading matter with a view to restrict the cost of production within the limits of the sanctioned estimate. In addition, cheap cover paper was also introduced. We hope the journal will revert to its old standard as soon as conditions improve. The students' annual supplement was published along with the June issue. We wish to record here our appreciation of the co-operation and promptness of The Scholar Press, Palghat. We thank the Department of Information, New Delhi, for the supply of numerous blocks concerning war subjects and we dare say the publication of such pictures has enhanced the interest in the journal. We wish particularly to express our grateful thanks to the Government of Madras and the Director of Agriculture for the annual subsidy of Rs. 400 which has been very helpful under the present high cost of production of the journal.

Subscribers The number of subscribers to the journal, who are not members of the Union, at the end of the year was 230 as against 227 in 1942, and 211 in 1941.

Exchange and free list The list is being maintained and copies of the journal are being reserved for despatch overseas as soon as shipping conditions improve.

Ramasastrulu-Munagala Prize Two essays were received for this prize and the judges appointed in this connection recommended the award to Sri P. A. Srinivasan, student, class III who sent in the essay on "An Economic Survey of the Marketing of Tobacco at Palghat". We take this opportunity to congratulate the author of the essay and to record our thanks to the judges. It may be recorded that this is the first time that a student has been awarded the prize.

Extension to the Union building The total expenditure under improvement to building came to Rs. 897—11—0 as against Rs. 875 provided for in the budget, for the year under report. The increase is due to the high cost of timber etc. used for the making of racks and other equipment intended for the new hall. Our thanks are due to the previous Secretary Sri V. Gomathinayagam Pillai for the ungrudging services rendered by him in this connection.

Acknowledgement The committee record their grateful thanks to all members of the Union for their valuable cooperation and to the Presidents of the year Messrs. P. V. Ramiah and C. R. Srinivasa Ayyangar for their ready help and valuable advice at all times.

SELECTED ARTICLE

Short Term Rubber Plants

Tropical rubber production has always depended on long term perennial plants. Wild rubber has, in Africa, been obtained from members of the family *Apocynaceae*, especially the lianes and shrubs of the genus *Landolphia*, while the cultivated rubbers have been trees belonging to the family *Euphorbiaceae*. The present reduction in supplies of rubber from the latter source has naturally directed attention to the possibility of obtaining rubber from plants that can be grown quickly and utilized at a comparative early age. These requirements limit consideration to plants that are herbs or small shrubs.

In the search for such plants the Soviet Union has taken the lead. In 1931—1934 thirty expeditions were organized in the Soviet Union to search for rubber-containing plants. Over a thousand species were examined, of which 609 were found to contain rubber or rubber-like substances. Only a few of these were thought suitable for cultivation including guayule (*Parthenium argentatum*), kendir (*Apocynum venetum*), vatochnik (*Asclepias cornuti*) and some plants belonging to the genera *Scorzonera* (tau-saghyz), and *Taraxacum*, (krym-saghyz and kok-saghyz). Of these by far the most important, both actually and potentially, are the first and the last, both members of the family *Compositae*, to which belong the familiar dandelion (another *Taraxacum*) and daisy.

Guayule, which is a shrub, has already received a good deal of publicity because it has been established as a commercial crop in California for some years. An immense expansion will now take place under a government scheme just sanctioned for production in the south-western U. S. A. The home of the plant is in Mexico, between latitudes 20° and 28°N., at altitudes of 3,000 to 7,000 ft. in a dry climate. The soils it favours contain a large percentage of lime. The rubber is contained in isolated cells mostly in the bark of the roots, stem and branches, but since latex cannot be induced to exude, the whole plant must be mechanically treated.

Indications are that good crop land will prove most suitable to guayule production. Rainfall of only eight to twenty inches a year seems sufficient for normal yields, provided that little or none of it occurs during the summer season, when rains discourage rubber accumulation in the plant. Except for certain seedling diseases and root rot in some areas, the plant appears to be rather resistant to insect and disease enemies. The guayule plants are cultivated like corn, four times the first year, three times the second and third years, then twice the fourth year. Harvesting is confined to the so-called dormant period when the rubber content of the plant is greatest.

Research financed by private enterprise has isolated strains with a relatively high rubber content that are now in cultivation by highly mechanized methods. Seed germination seems naturally low, only about 5 per cent, but by treatment this can be improved until there are but few failures. It was at first stated that while rubber could be obtained at two years old, four to six years was regarded as the best age. Later, as a result of selection and improved cultural treatment young plants less than a year old were claimed to contain "6·3 per cent of pure caoutchouc on a bone-dry deleafed basis" a yield equivalent to 1,164 lb. per acre, and it was thought possible to produce as much rubber per acre in two years as was formerly counted on in four years. The latest reference available quotes the yield of rubber at four years old as 20 per cent of the dry weight of the shrub, with a resin content of 16 per cent in the extracted rubber.

On harvesting the shrubs are pulled, chopped, thoroughly dried and crushed—all, like the planting and cultivation, by highly mechanised methods before being conveyed to continuous-feed tube mills. After repeated disintegrating and washing of the plant debris the rubber agglomerates into pieces up to the size of a pea, which can then be separated by flotation. Laboratory analysis shows that by these methods only 25 per cent of the rubber present in the shrub fails to be recovered. When deresinated the rubber is said to be a perfect substitute for high grade plantation rubber.

Attempts are being made to get seed of guayule for trial in East Africa, but the soil, climate and length of day in its native country being what they are, the chances of its being grown successfully in East Africa are not great.

Taraxacum kok-saghyz, the herbaceous plant producing most of the Soviet Russian natural rubber, is native at 7,000 to 8,000 ft in the Tian-Shan. The cultivated plant fructifies at the end of the first year of growth, and may then be used for obtaining rubber, which is localized in the roots in the form of long filaments. Selection is proceeding with the object of transforming cultivated strains from fibrous-rooted into thick-rooted plants with high yields and an improved rubber content in the second year. The rubber is obtained by reducing the roots to a fine powder which is macerated in water. The rubber, which then separates out by gravitation, is of satisfactory quality, though not equal to *Hevea*. The record yield obtained is about 200 lb. of rubber per acre.

Although the natural habitat of kok-saghyz is on alkaline soils it will grow on soils with a pH as low as 4·5. In Russia germination is secured in 4–5 days instead of 40–50 by keeping the seed before planting at freezing point and well moistened. On mineral soils about 2 lb. is sown to the acre, and preferably after a crop that has received both organic and mineral manures. The best root growth is obtained on peat soil that have been limed. Careful cultivation is necessary, at first to keep weeds down and later to maintain good aeration.

The prospects of kok-saghyz being a satisfactory source of rubber in East Africa are probably negligible. None of the environmental factors of the areas in which it is native or successfully grown in the Soviet Union are avilable here. Over a hundredweight of seed has recently been sent by air* from Russia to Minnesota, where it is expected to do well with an annual rainfall of 20 inches and a hard winter.

The second most promising rubber plant in Russia is *Taraxacum megaliarhizon* which contains a very high quality rubber superior even to *Hevea*, but in only small quantities. It is disappointing to find that the 6 per cent content of the roots in the wild plant drops to less than 1 per cent in the cultivated.

In *Apocynum venetum* and *Asclepias cornuti* the rubber is localized mostly in the leaves, which may contain up to 10 per cent, apparently of rather poor quality. In the former plant the stems are cut twice a year and on the figures quoted the yield per acre may vary from about 20 to nearly 400 lb.—R. E. M.—*E. Afr. Agric. J. Oct. 1942.*

Gleanings

World's milk record In the United States, a nine-year-old Holstein—Friesian cow named Carnation Ormsby Madcap Fayne, set a new world's record for milk production.

Each day Carnation Ormsby Madcap Fayne (Capper for convenience) gave 55 quarts of milk. Each 15 days she produced her own weight in milk. Each month she produced almost as much as an average cow would produce in a year. At her peak, Capper averaged over 140 lb. daily for 20 days running. One day she responded with 146·5 lb —approximately 70 quarts (wine measure).

On the last day of her test Capper gave enough milk to bring her year's total up to 41,943·4 lb.—*Dairy News Letter* (*Indian Farming, March 1943.*)

Test for over-polished rice In a number of tests carried out to find a method by which undermilled rice can be distinguished from over-polished rice, it was found that iodine solution of 0·05 per cent strength turns the polished rice grain to blue-black in 60 seconds, while the same solution gives rise to streaks of blue-black colour on rice that is under-polished.

It was seen that rice passed twice through the huller turns blue-black while rice passed once shows only streaks of blue-black, indicating thereby that the bran layer has not been completely removed. It has been found that a single milling is enough to produce good cooking quality in rice. The above test will be of use to distinguish the undermilled from the highly polished rice, when the state regulates the degree of polishing of rice, so that 4 to 5 per cent more of rice stocks could be obtained by undermilling. (*Indian Farming, March 1943.*)

Hints for Bee-keepers

For September, 1943.

Unfavourable weather and pasturage conditions continue during the current month also, but show a tendency to improve towards the latter half of the month if there is timely receipt of rains. Pollen is collected from a variety of crops such as maize, castor, babool, gingelly, cumbu, *Ailanthus excelsa*, safflower, niger, zinnia, sunflower, and *Mimosa pudica* and a scanty supply of nectar is available from gingelly, cucurbitaceous plants, safflower, niger, balsams, white babool, sunflower and *Chionachne koenigii*. Breeding continues to be poor and the bee enemies also are active. The hints regarding the upkeep of the colonies during the slack season, control of bee enemies etc., given in the previous issues should be carefully followed. Better bee activity is, however, evinced during the second half of the month, if the usual rains are received in time. As the prosperous season is likely to commence from the next month onwards, the period will be quite opportune for one to increase his stock. It would therefore be advantageous to make the necessary bee-appliances before hand and keep them ready. The minimum equipment necessary for starting a new Apiary will be about half a dozen hives, a honey extractor, a drone trap, a piece of queen excluder sheet, a bee-escape and a few sheets of comb foundation. These may either be made locally according to the specifications given in the Bulletin No. 37, Department of Agriculture, Madras or the local Agricultural Demonstrator or the Government Entomologist, Lawley Road P. O., may be addressed on the matter.

M. C. Cherian & S. Ramachandran.

Correspondence

Grow More Food Campaign—Some suggestions

To

The Editor, The Madras Agricultural Journal.

Sir,

In these days of war, the necessity of an increased yield of agricultural produce is vitally important. The Grow More Food Campaign launched by the Government has stressed the need of raising food crops in all available land. It is deplorable that the propaganda now carried on, is confined only on the theoretical side. The practical aspect of the problem is not receiving due attention. In the course of this letter I propose to give some suggestions, which if carried out would relieve economic hardship.

At present the Revenue and National War Front Officials are doing the propaganda work. Food-Grain-Purchase Officers are recruited from the Revenue Department. These officers cannot be expected to tackle the practical side of the problem. If Agricultural Officers are appointed they will be able to deal with the practical side of the problem, and can avoid waste by storage etc. Moreover the present strength of the Agricultural Department is quite inadequate for the purpose. In peace-time, when food shortage was not so keenly felt, it was sufficient to have a Demonstrator for each taluk. But now each revenue *firka* must have a demonstrator who must be asked to frequently visit all the villages and advise the *ryots* on the cultivation of their lands.

He can easily get hold of a land-lord who may be willing to cultivate his lands under his supervision. His yield from the land must naturally be greater than that of previous years. The other *ryots* would find that he gets a bumper crop and would naturally copy his methods of cultivation with the result, maximum yield is got from all the land in the village.

The practice of frequent transfer of Agricultural officers and placing more districts under the control of one District Agriculture officer is greatly to be regretted. The study of the conditions of the locality and the drawbacks of the local practices of cultivation take a long time. In the interest of the Agricultural development these officers should not be frequently transferred from one place to another.

Statistics reveal that the yield from land could be increased by 10% by sowing good seed. A further 5% yield could be secured by the application of scientific manure. At present the *ryots* experience during cultivation season, great difficulty in getting good seeds and manure. Even if they are available the merchant demands a high price for the manure. Since the price demanded is so exorbitant the *ryot* is obliged to cultivate his land with an insufficient quantity of cheap manure. As a consequence he gets a poor crop.

The Demonstrators in each *firka* must be asked to stock manure, and good departmental seeds. They must advance manure and seed to the *ryots* with the assistance of the Village Officers, during cultivation season. The *ryot* being poor is not able to stock manure for the next crop at a time when the price of manure is low. It will indeed be of great help to the *ryot* if the Agricultural Depots stock manure when it can be had cheaply, and supply him his requirements. The *ryot* may be asked to pay its cost either in kind or in cash. He can be asked to supply the Depot his produce towards its cost. The Railway authorities also must afford facilities for the transport of manure at a concession rate.

In the matter of stocking and supplying of manure the Co-operative Department must step in and afford to the *ryots* all possible aid. The co-operative societies may be asked to stock manures when their prices are low and distribute them to the *ryots*, charging a small profit. But the co-operative stores that stock manure at present do not have the *ryots'* welfare in view and are charging them heavy prices, just like the hoarding merchant who blackmarkets his goods. The attention of the Registrar must be drawn to this fact, so that he may be pleased to direct the co-operative stores and societies not to charge excessive profits on such items as are indispensably necessary to the *ryot* to secure the maximum yield from his land. Any amount of propaganda can be of no avail, unless the means whereby he can increase his yield are made available to the *ryot*.

In these days of economic dislocation, hoarding is prevalent everywhere and stocks of paddy are not released by the landowners. Government control cannot effectively check this evil. Every *ryot* would try to get the maximum price for his produce. The present control price of paddy is very low considering the heavy rise of prices of other articles and rise in wages. It is but just that the prices of food-stuffs are revised according to the increased rates of wages and cost of living. The services of the Agricultural Officers may be requisitioned for the determination of the price, after due consideration of the cost of cultivation and the reasonable margin of profit to be left to the *ryot*. The Agricultural Officers will be able to supply statistics from the Government farms regarding cost of cultivation etc. When a fair price is fixed, naturally *ryots* will release their stock of paddy and there will be no inducement for hoarding, and the excess of paddy that each *ryot* has would be made available to the general public and food scarcity would be relieved.

I am sure that if these suggestions mentioned above are carried out, it would go a long way in ameliorating the lot of the poor *ryot* and the general public as well.

Ilanji, Tenkasi,
July 19, 1943.

(Sd.) I. S. Kuttalalingam

MANURE FROM TOWN-WASTES

Training Course for Biochemists at Bangalore

(From a correspondent)

Sir,

The training course for biochemists deputed by different Provinces and States in India in the improved process of preparing compost manure from town wastes developed at Bangalore, was formally inaugurated at the Indian Institute of Science, Bangalore, on the 4th August 1943. It may be recalled that the Government of India recently sanctioned a sum of nearly Rs. 2½ lakhs for a programme of large scale preparation of compost manure from town wastes, the scheme to be worked under the auspicies of the Imperial Council of Agricultural Research.

Sir J. C. Ghosh, Director of the Indian Institute of Science, in welcoming the biochemists to Bangalore, pointed out the important role played by the present scheme as a vital part of the Grow More Food campaign and hoped that the biochemists would take full advantage of the opportunities offered under the scheme and do their level best to make a success of the programme and thus alleviate the present serious position in the matter of food production in this country.

Dr. Gilbert Fowler who next addressed the biochemists pointed out the great interest he has taken in the subject for some decades past. Preparation of compost manure from waste materials, he said, is not such a simple matter as it

may appear to be on the surface. It involves the application of fundamental scientific knowledge, especially in relation to the transformation of carbon, nitrogen, phosphoric acid, potash and humus. This scientific knowledge should be adapted to local conditions and the process should be carried out in a manner to satisfy hygienic requirements (e. g. the absence of smell and fly-breeding) and at the same time on an economic basis so as to make the product as cheap as possible. He cited the example of the Chinese who did not fight shy of using human wastes on land.

Prof. V. Subrahmanyan, who followed next, said that till now several people had gone out from the Indian Institute of Science to occupy responsible positions in industrial and scientific institutions in the country; but this is the first time that people holding high positions outside have come to the Institute to be trained in improved scientific processes. He traced the history of the work carried out at the Institute on compost manufacture, starting from the pioneering work of Dr. Gilbert Fowler some 20 years back and culminating in the latest researches of Dr. Acharya. He mentioned that in recognition of the success of the work carried out by the Institute, the Government of India have now come forward with a large grant of Rs. 2½ lakhs to introduce the process developed at the Institute throughout India. He mentioned that when he was in England, in 1938-39, the view was expressed that India was leading the world in the matter of compost production; and added that the present scheme would take us several steps ahead of other countries in this direction.

Dr. C. N. Acharya, Chief Biochemist in charge of the Training Scheme, thanked Sir J. C. Ghosh, Dr. Fowler and Prof. Subrahmanyan for the welcome accorded to the Biochemists and pointed out that the new scheme would require for its success a great deal of organizing capacity in addition to scientific skill on the part of the Biochemists and would prove to be a highly responsible task for them.

Indian Institute of Science,
Bangalore, August 7, 1943.

(Sd.) C. N. Acharya

Crop and Trade Reports

Statistics—Crop—Sugarcane—1943—First forecast report The average area under sugarcane in the Madras Province during the five years ending 1941-42 represents 3·1 per cent of the total area under sugarcane in India. The area under sugarcane up to 25th July 1943 is estimated at 118,020 acres. When compared with the area of 97,860 acres estimated for the corresponding period of last year, it reveals an increase of 20·6 per cent. The estimated area is the same as that of last year in Nellore, Chingleput and Tinnevelly. An increase in area is revealed in Vizagapatam, Kistna, Guntur, Bellary, Anantapur, South Arcot, the Central Districts, Tanjore, Madura, Ramnad and the West Coast owing to the favourable price of jaggery and a decrease in area in East Godavari, West Godavari, Kurnool and Cuddapah. The increase in area is marked in the Central districts (+12,760 acres), Bellary (+2,770 acres), Vizagapatam (+1,500 acres) and Madura (+1 030 acres).

The condition of the standing crop is reported to be generally satisfactory except in Chingleput where the crop is reported to have been affected to some extent by insect attack.

The wholesale price of jaggery per imperial maund of 82$\frac{2}{7}$ lb. (equivalent to 3200 tolas) as reported from important markets on 7th August 1943 was Rs. 15-13-0 in Erode, Rs. 14-2-0 in Salem, Rs. 13-15-0 in Mangalore, Rs. 12-13-0 in Cuddalore, Rs. 12-3-0 in Cocanada, Rs. 12/- in Chittoor, Rs. 11-15-0 in Bellary, Rs. 11-8-0 in Rajahmundry, Rs. 10-5-0 in Coimbatore and Vellore and Rs. 10-1-0 in Adoni. When compared with the prices published in the forecast report

issued at this time last year, these prices reveal a rise of approximately 79 per cent in Bellary, 27 per cent in Cocanada, 20 per cent in Erode, 19 per cent in Salem, 16 per cent in Rajahmundry, 15 per cent in Mangalore, 12 per cent in Cuddalore and 6 per cent in Chittoor and a fall of approximately 9 per cent in Adoni, 7 per cent in Vellore and 4 per cent in Coimbatore.

Statistics—Crop—Gingelly—1943-44—First forecast report The average area under gingelly in the Madras Province during the five years ending 1941-42, represents 15·6 per cent of the total area under gingelly in India. The area under gingelly up to 25th July 1943 is estimated at 315,900 acres. When compared with the area of 299 600 acres estimated for the corresponding period of last year, it reveals an increase of 5·4 per cent. The increase in area occurs in the Circars, Kurnool, Bellary, Cuddapah, Nellore, Chingleput, Trichinopoly and Tinnevelly and is attributed partly to timely sowing rains and partly to the high prices ruling for gingelly seed. The variations are marked in Vizagapatam (+16.000 acres), West Godavari (+14,000 acres), Chingleput (+6,500 acres), South Arcot (−4,200 acres) and Salem (−9 900 acres).

The condition of the crop is reported to be generally satisfactory except in the Divi taluk of the Kistna district where the crop is reported to have been submerged by heavy floods in the Kistna river, and in parts of the districts of Bellary, South Arcot and Coimbatore where the crop is reported to have suffered from drought to some extent. The yield is expected to be generally normal in the other districts.

The wholesale price of gingelly seed as reported from important markets on 7th August 1943 was Rs. 16—6—0 in Tuticorin, Rs. 15—13—0 in Trichinopoly, Rs. 15—7—0 in Cuddalore, Rs 15—6—0 in Salem, Rs. 14—15—0 in Tinnevelly, Rs. 13—14—0 in Ellore, Rs. 13-9-0 in Cocanada, Rs. 13-6-0 in Rajahmundry, Rs. 13-5-0 in Vizianagaram and Rs. 11-9-0 in Vizagapatam. When compared with the prices published in the report for the corresponding period of the previous year, i. e., those which prevailed on 10th August 1942, these prices reveal a rise of approximately 67 per cent in Tinnevelly, 72 per cent in Vizianagaram, 60 per cent in Ellore and Salem, 58 per cent in Tuticorin, 52 per cent in Rajahmundry, 51 per cent in Cocanada, 50 per cent in Cuddalore and 44 per cent in Trichinopoly. (*Secretary, Board of Revenue—Civil Supplies, Madras*).

Cotton Raw, in the Madras Presidency The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February to 6th August 1943 amounted to 278,212 bales of 400 lb. lint as against an estimate of 406,300 bales of the total crop of 1942-43. The receipts in the corresponding period of the previous year were 465,400 bales. 398,233 bales mainly of pressed cotton were received at spinning mills and 839 bales were exported by sea while 157,668 bales were imported by sea mainly from Karachi and Bombay. (*From Director of Agriculture, Madras*).

Mofussil News and Notes

Agricultural exhibitton at Thirukannapuram Under the auspices of the National War Front, an Agricultural Exhibition was conducted from 8th to 10th July, 1943 at Thirukannapuram, Nannilam Taluk, during the Kumbabishekam festival occuring once in 30 or 40 years. The exhibition was opened by Sri. M. Anandan, L. Ag., District Agricultural Officer, Tanjore. The Tahsildar, Sri. S. K. Vedamuthu, B. A., presided. Before opening the exhibition the District Agricultural Officer explained the difficulties in procuring food grains in other districts and exhorted the audience to produce more and give as much as they can for the starving millions in the deficit districts. The exhibits included paddy strains, groundnut strains, hand paddy husker, the specimens of green

manure crops of *kolinji*, *daincha*, sunnhemp, *pillipesara*, Sesbania etc., Fruit plants from the South Indian Lakshmi Nurseries, Kumbakonam, Coconut seedlings from Adirampatnam, Potato varieties from Nanjanad, Canned fruit products from Kodur, specimen of insect pests and diseases and posters depicting the various ways and means of increasing yields of crops. There were large crowds of visitors to the exhibition.

M. A.

Grow More Food Exhibition at Trichinopoly. An Agricultural "Grow More Food stall" was put up during the Fourth War Services Exhibition organized by the Department of Publicity and Broadcasting (New Delhi) at Puthur Maidan, Trichinopoly from 16th to 26th July 1943.

The object of this kind of Grow More Food stall, in the midst of war propaganda was to instill the idea into the minds of the visitors and to encourage them to grow more of food crops, vegetables and fruits. All kinds of vegetables both foreign and indigenous, all varieties of greens, numerous kinds of fruits of the plains and the hills, were kept on show. Prepared food stuffs which are deemed handy to the army like, puffed rice, beaten rice, fried bengal-gram, cholam, cumbu and ragi malts were exhibited. The preparation of malts from the above grains was demonstrated. Rotis both sweet and salted were prepared from the flour of these grains in an improved hearth which operated three pans at a time but consumed less fuel than a country one. The hand pounding of paddy in a wooden grinder was also demonstrated. The usual agricultural exhibits were also on show. Agricultural posters on grow more food etc. were hung prominently.

The Co-operative Department put up a creamery and a hand loom product stall. Advertisements on "Drink More Milk" were prominently put in view. Pure milk, khoa and ice cream were also distributed free to some distinguished visitors.

The Exhibition was opened by Sir P. T. Rajan, Ex-Development Minister, Madras and it attracted a large crowd of visitors every day. Among the distinguished visitors were Sir T. Boag, Adviser to the Government of Madras, S. K. Chettur Esq., Collector of Trichinopoly, C. Ramaswami Esq., Deputy Director of Agriculture, Coimbatore, the Rajah of Pudukottah and Khan Bahadur P. Kalifullah Sahib, Administrator, Pudukottah State.

T. G. A.

College and Estate News

Students' Corner The inaugural address of the students' club was delivered on 9-8-'43 by Sri K. C. Ramakrishnan, M.A., Lecturer in Agricultural Economics with Sri S. N. Chandrasekhara Ayyar, M.A., Lecturer in Botany, in the chair. The meeting was well attended. The lecturer dealt on the place of Economics in Agriculture and exhorted the students to study that aspect as well as others.

Games *Hockey* The opening match of the season was played against the officers' X and it ended in a draw with one goal each side. Two more matches were played in one of which the officers were defeated but in another they won. In a match played against the Reserve police, our team won by one goal to nil.

Foot ball In the first match played against the Government Arts College, our team won by 2 goals to nil.

Cricket The opening match of the season was played against the officers XI in which the students sustained bad defeat scoring only 35 runs against 135 runs by officers—Mr. K. B. Datta 52 runs including five fours and one six and Mr. K. M. Thomas 27 runs retired.

In another match played against Stanes European High School on 31st July 1943 on our grounds, the College scored 74 runs (Muthukumarappa and Raghavan 13 each) against 62 (A. S. Krishnan 6 for 26) scored by the visitors.

RETIREMENT

Sri K. RAGHAVACHARYA, L. Ag

Sri K. Raghavachari one of the foundation members of the Madras Agricultural Students' Union, retired from the post of District Agricultural Officer, South Arcot District on 15th July 1943. He took his diploma in agriculture in 1913, securing Kees prize for Agricultural chemistry. He joined the Agricultural Department in June 1913 and worked in the districts as manager of agricultural research stations like Palur, Hagari, Bantanalal, and Hosur. He won the Ramasastrulu Munagala, and Vengail Krishna Nainar prizes. He was the first *aluminus* of the College of Agriculture, Coimbatore to take up the teaching of Practical Agriculture in which he earned good name of being an impressive teacher with wide experience and depth of knowledge and was on that account chosen as lecturer more than once. He was a member of the Academic council of the Madras University. He was gazetted in 1922. As a District Agricultural Officer he served in the Ceded Districts and in all the Tamil districts except Ramnad and Tinnevelly.

During the early days of the Madras Agricultural Students' Union he took active part in its management by working as its manager and later on as its secretary.

Being of an engaging disposition, alert and keen in observing agricultural practices and suggesting new ideas about their improvement, he retained the affection and respect of all his colleagues and students. We learn that he has settled in his village in Tanjore district and taken up farming. We are sure that he will prove there a good exponent of improved agricultural methods and a reliable guide to his brother agriculturists. We wish him success in his new sphere of life.

Departmental Notifications

Gazetted Service—Appointments—Postings and Transfers

Sri P. Venkataramayya, Agricultural Chemist and part time Principal, Agricultural College, Coimbatore is appointed to officiate as wholetime Principal, Agricultural College, Coimbatore.

Sri H. Shiva Rao, Assistant Agricultural Chemist, Coimbatore is appointed to act temporarily as Agricultural Chemist, Coimbatore *vice* Sri P. Venkataramayya.

Sri Rao Bahadur V. Ramanatha Ayyar, Cotton Specialist and Geneticist, Coimbatore, is appointed to officiate as Headquarters Deputy Director of Agriculture, Madras.

Sri R. Balasubramanya Ayyar, officiating Assistant Cotton Specialist, Cocanada Cotton Scheme, Narasaraopet, is appointed to act temporarily as Cotton Specialist, Coimbatore, *vice* Sri Rao Bahadur V. Ramanatha Ayyar.

Sri M. Suryanarayana, Assistant in Chemistry, Coimbatore, is appointed to officiate as Assistant Agricultural Chemist, Coimbatore *vice* Sri H. Shiva Rao.

Sri C. M. John, Oil Seeds Specialist, Coimbatore is appointed as Oil Seeds Specialist and Geneticist with effect from the date Sri Rao Bahadur V. Ramanatha Ayyar hands over charge of the post.

Sri K. Govindan Nayar, Assistant in Chemistry, Coimbatore to officiate as Assistant Agricultural Chemist, Coimbatore during the absence of Sri M. Suryanarayana.

Sri C. Jaganatha Rao, Assistant in Cotton, Agricultural Research Station, Hagari is appointed to officiate as Assistant Cotton Specialist, Cocanada Cotton Scheme *vice* Sri R. Balasubrahmanya Ayyar.

Sri G. Ganapathi Ayyar, Assistant in Chemistry, Coimbatore is appointed to act temporarily as Assistant Agricultural Chemist from 26-7-43

Sri D. Viswanatha Reddy, Farm Manager, Central Farm, Coimbatore is appointed to act temporarily as Assistant Marketing officer, Madras.

Sri T. G. Muthuswami Ayyar on return from leave to be D. A. O. Tinnevelly.

Sri K. Jagannatha Rao on return from leave to be D. A. O. Kurnool

Sri A. Gopalakrishnaiah Nayudu, on return from leave to be D. A. O. Nellore

Sri A. Chidambaram Pillai D. A. O. Cuddalore to be D. A. O. Guntur.

Janab A. Gulam Ahmed Sahib Bahadur on return from leave to be D. A. O. Cuddalore.

Leave

Sri T. S. Ramasubramania Ayyar, Assistant Agricultural Chemist (on leave) extension of l. a. p. for 7 days and half average pay for 4 months and 20 days from 13-4-43 preparatory to retirement.

Sri V. K. Subramania Mudaliar, D. A. O. Kurnool l. a. p. for 4 months from the date of relief.

Subordinate Services—Appointments

The following fieldmen are appointed to officiate as upper subordinates with effect from 10-8-43.

Sri P. Lakshmanababu, Fieldman, A R. S. Samalkottah to be A. D. Kurnool Dt.

Sri P. R. Nagaraja Rao, Fieldman, Millets Section, Coimbatore to be Asst. in Entomology section, Coimbatore.

Sri K. Kanniah, Fieldman, A. R. S. Tindivanam to be F. M. Central Farm, Coimbatore

Sri K. V. Chelamiah Sastry, Fieldman, A.R.S. Siruguppa to be F. M. Siruguppa.

Sri T. V. Subramaniam, Fieldman, Central Farm, Coimbatore to be Asst. in Mycology section, Coimbatore.

Promotions

The following grade promotions of upper subordinate in the Agricultural Section are ordered with effect from the dates noted against each:-

Sri T. G. Anantha Rama Iyer, D. A. O. Trichinopoly II Grade (old) to I Grade (old) from 1-4-41.

Sri M. P. Gourisankara Ayyar, A. D. Devakottah, III Grade (old) to II Grade (old) from 3-9-41.

Sri T. G. Muthuswami Ayyar III Grade (old) to II Grade (old) from 3-9-41.

The following Lower subordinate promotions to upper subordinates in the Agricultural service in the new III Grade are ordered with effect from 1-4-43:-

Messrs. M. Gopala Rao, A. D. Viziayanagaram, R. Narasimha Acharya, A. D. in Entomology, Saidapet, and C. L. Narasimha Rao A. D. Rapalli.

The following grade promotions of lower subordinates in the Agricultural subordinate service from V Grade to IV Grade take effect from 1-4-43.

Messrs. P. A. Kunbiraman Nambiar, A. D. Tiruchendur, Y. Venkateswara Rao Nayudu A. D. Gudivada, and K. Krishna Hegde, F. M. Sim's Park, Coonoor.

Postings and Transfers

Name of officers	From	To
Sri N. Venkayya	F. M. A. R. S. Siruguppa	Asst. in Millets A. R. S. Guntur.
,, S. Suryanarayana	A. D. Vizagapatam	A. D. Vizagapatam for special duty for supply of Fresh Fruits and onions to troops
,, K. V. Chelapathi Rao	A. D. Tanuku	A. D. Chintapalli special duty for the cultivation of vegetables
,, K. Veerabhadra Rao	A. D. on special duty Chintapalli	A. D. Narasapatam
,, P. S. Krishnamurthi	Entomology Asst. (on leave)	Entomology cum Mycology Asst. Nellore
,, T. Lakshmipathi Rao	A. D. Bheemavaram	A. D. Tadepalligudam
,, U. Ananda	F. M. A. R. S. Kasargode	F. M. A. R. S. Nileshwar
,, K. Sheenappa	F. M. A. R. S. Nileshwar	F. M. A. R. S. Kasargode
,, V. Satagopa Ayyangar	Offg. D. A. O. Tinnevelly	A. D. Mayavaram
,, M. Vaidyanathan	A. D. Wheat Rust Scheme, Ootacamund	A. D. Coonoor.

Leave

Name of officers	Period of leave
Sri R. Govindaramayya, F. M. A. R. S. Pattukottai	Extension of l. a. p. for 2 months from 27-7-43.
,, T. V. Srinivasacharlu, A. D. Perambudur	Extension of l. a. p. on m. c. for 2 months from 20-7-43.
,, M. K. Swaminathan, A. D. Orathanad	Extension of l. a. p. on m. c. for 2 months from 16-7-43.
,, M. P. Sankaran Nambiar, A. D. Dharapuram	L. a. p. for 1 month from 26-7-43.
,, M. P. Gourisankara Iyer, A. D. Devakottai	Extension of l. a. p. on m. c. for 4 months from 5-8-43.
,, V. Atchutan, A. D. Tiruvur	L. a. p for 1 month from the date of relief.
,, K. Brahmachari, Asst. in Entomology, Nellikuppam	L. a. p. for 1 month from 5-8-43.
,, S. Krishnamurthi, Asst. College Orchard, Coimbatore	Extension of l. a. p. for 1 month from 1-8-43.

The Madras Agricultural Journal

(ORGAN OF THE M. A. S. UNION)

Vol. XXXI SEPTEMBER 1943 No. 9.

EDITORIAL

The Production of Milk Dr N. C. Wright computed the consumption of milk to be 7 ounces per head of population in India, when he surveyed the cattle and dairy industries in 1937. This is conceded to be low. Public health and nutrition workers stress that the average intake of milk in India should be at least 15 ounces and that the consumption should be doubled. It is said that the new edition of the *Report on the Marketing of Milk* points out that the consumption of milk in India is just 5·8 ounces per head. The dietary requirements are met to a little over a third, instead of a little less than half as estimated previously. This state of affairs is not desirable and demands the immediate attention of authorities responsible for the well-being of the nation. Milk supplies first class proteins of high biological value, makes up the deficiency of minerals and vitamins in the common Indian vegetarian menu and is a highly protective food. The low consumption and production of milk is not a matter for complacency, but one of grave concern. We have already referred on previous occasions to the necessity for concentrating attention on the development of cattle during the post-war reconstruction period. The low figure of the consumption of milk given in the marketing report should further stress the need for such a policy.

The increased production of milk by itself is not enough. Side by side the effective demand for milk should also be increased by reducing the cost of production of milk or by increasing the purchasing power of the poorer classes or by both, so that everybody could have his quota of milk. But what is it that we find? The cost of production of milk has increased considerably due to increases in the price of feeding stuffs and the cost of cows, caused by conditions created by the War. Along with it the population in the country has increased,—may be temporarily and partaking of the nature of a floating population—and the demand for milk has increased. With increased cost of production and a heavy and unprecedented demand, the price of milk has gone up in the urban areas and is going up further every day. This upward trend in the price of milk is seen in other countries also. The price of milk fixed by the Pure Milk Association of Chicago was 2·38 dollars per cwt. in February 1942 and 2·95 dollars in February 1943 (roughly equal to 11 lb. per rupee), that is by 24 per cent nearly. The spiral of shooting prices is much higher here. To illustrate: The price of milk at the Co-operative Milk Supply Union, Coimbatore

was one anna four pies per lb. (=¼ Madras Measure) in February 1942 and three annas six pies now in September 1943. This is about 4½ lb. of milk per rupee, 160 per cent over and above the 1942 February price at Coimbatore and 144 per cent over the highest price in Chicago. It may be that there is justification for so putting up prices; may be that the cost of producing milk is so much, but one thing is certain: this will have disastrous consequences. The people who need the milk most will not be able to purchase it, the poor children will not have the milk they require for their maintenance and growth and the effect of this will be far-reaching. The country will be raising more weaklings, susceptible to go under with the least unfavourable environment. When epidemics like cholera, typhoid and dysentry make their appearance, the famine areas, especially after a period of famine, suffer the most. The incidence of the diseases and the resulting mortality are great. The people are in a run-down condition and do not have sufficient vitality to stand these diseases. Want of sufficient nutrition during the growing period of individuals affects them in a similar manner. Their system is enfeebled and stamina to stand diseases and rough life is reduced permanently for life.

Increasing the production of milk in the country and reducing the cost of production are obviously national necessities. The production of milk can be increased by selective breeding from the best stock, by judicious feeding and by checking up the economics of production by maintaining in a systematic manner milk-production records. This is the method adopted in all countries producing good quantities of milk economically; milk-recording and maintenance of records of animals through generations have come to stay in those countries. This, in brief, is the history of the evolution of the world famous milk breeds of the day. The heaviest milk yielding cow in the world is Carnation Ormsby Madcap Fayne, with a daily average milk-yield of *seventeen Madras Measures*; during the peak period she was giving *thirty-five Madras Measures*. This has been achieved by selective breeding for generations.

Rationing The rationing of rice has been introduced in Madras with effect from the beginning of this month. We are told that the anxiety that was prevalent among the poorer classes has given place to a feeling of confidence. Uncertainty about the morrow has been done away with. What is in stock will be available and distributed equally among all the people, rich and poor alike, is the feeling of the people. It is understood that rationing is to be extended to the mofussil towns also and that preliminary enumeration and other arrangements are being made therefor. This should be a solace to the town dwellers in the deficit districts and this should set at rest their anxiety about the future. We have no doubt that such a beneficient measure has come none too soon, and that in due course it will be extended to other commodities as well, as and when the need arises. The preliminary work that has been done and the experience gained in the actual working of the rationing of rice would make the extension of rationing to other essential commodities comparatively an easy task.

A Brief Survey of the Palghat Tobacco Market *

By P. A. SRINIVASAN, III Year B. Sc. (Ag.)

Student, Agricultural College, Coimbatore.

Introduction Among the various uses to which tobacco is put to, chewing occupies a major place and 25 per cent of the area and production of tobacco in this province is under chewing varieties. It has been recently estimated that consumption of chewing tobacco is at the maximum in the States of Cochin and Travancore and in British Malabar. Palghat is the most important centre for the assembling and wholesale distribution of chewing tobacco grown in the Coimbatore and adjacent districts. The Palghat market buys outright the produce from these districts and processes them to meet the tastes of the West Coast consumers.

The following is the result of an enquiry conducted at the Palghat tobacco market with the idea of studying the systems of assemblage, curing, trade and distribution from Palghat, and the scope for improvement in the system of marketing is suggested.

Palghat as an assembling centre Palghat has grown into importance in this trade for over a century due to the enterprise of certain merchants, mainly the Muslim Rowthers—who had dealings with the Tamil districts in other commodities. Apart from its commanding geographic position as the gateway between the Tamil districts and the West Coast it has gained in importance in this trade on account of the spirit of enterprise of the expert commission agents and the assembling middlemen. Palghat has the advantage of high humidity of the atmosphere due to the copious rainfall of 85 inches per year both during the South West and the North East monsoons, just in these months when most of the tobacco from producing districts is imported, which facilitates easier handling and processing of the produce. This cannot be done in the drier districts where the tobacco is grown and where the preliminary curing after the harvest of the leaves, is done.

Chewing tobacco is of many grades varying in taste and flavour. The consumers of the various parts of the Kerala territory require different grades of tobacco and as the consumers cannot go about the growing districts to select their particular speciality, all the varieties are assembled, processed and kept at Palghat for inspection, selection and final sale.

Besides this, the growers are badly in need of money. They are financed by the commission agents who are adepts in the business. Again, the grower is not an expert in processing and sorting the cured stuff to suit the different markets in the West Coast. It is said that in olden times some growers used to bring curing experts from Palghat for curing tobacco on their own farms, but it is no longer in vogue. Thus gradually this town

* Ramasastrulu Munagala Prize Essay 1942-43.

has gained in importance in assembling, sorting and distributing, the cured commodity to the different parts of the West Coast.

Sources of supply It has been computed that annually about 25,000 to 30,000 candies (of 500 lb. each) of cured leaves are imported into Palghat from the districts of Coimbatore, Trichinopoly and Madura (vide *Report on the Marketing of Tobacco in Madras.*)

TABLE I **Imports and exports of chewing tobacco in the Palghat tobacco market in bales of 125 lb. each**

Years—	1937-38	1938-39	1939-40	1940-41	1941-42	1942-43
Imports	150,260	165,300	140,060	135,000	135,200	135,150
Exports	111,650	123,060	106,210	101,490	101,390	101,370

About 76 per cent of the imports is from the Coimbatore District, 16 per cent from the Madura District and 8 per cent from the Trichinopoly District. Satyamangalam, Puliyampatti, Gobichettipalayam, Erode, Chithode, Avanashi, Adiyoor, Pollachi, Udumalpet, Dharapuram, Palladam and Kangayam in the Coimbatore District, Karur in the Trichinopoly District and Palni and Oddanchatram in the Madura District are the main centres from which chewing tobacco is supplied to Palghat.

Supply season In the Coimbatore District transplanting is done in October — November, harvesting in January — February and curing up to March. The supply season begins by the third week of March and goes on up to the end of August. In the Madura and the Trichinopoly Districts sowing and transplanting are two months later and harvesting is in February-March, and the supply season starts by May and ends with July. So the period of supply extends from March to August.

Varieties There are mainly two varieties coming into the wholeseale market, viz. Meenampalayam and Thenmukham (or Udumalpet). The latter is inferior in quality and is grown in the vicinity of Pollachi and Udumalpet. The other variety is grown in other parts of Coimbatore and in the Madura and the Trichinopoly Districts. There are more than two grades in each of these varieties.

Methods of transport Transport is as a rule by means of bullock carts. In olden times bales were brought on bullocks' back and it was done on a co-operative basis among the importers or assembling middlemen with a view to escape the highway robbery prevalent in those days. Even now way-side pilfering is not uncommon; so transporting is done by a number of carts (25 or 50) plying together between the centres of production and Palghat. Bullock cart transport is resorted to up to a maximum distance of 80 miles. About 25 percent of the imports is by rail, a negligible percentage is by lorries and the rest by bullock carts. Transport by rail is very common from Oddanchatram and Palni in Madura, but is rare from the Coimbatore District. But if there is any trouble on the road due to high winds, heavy rains or floods, the produce is sent to Mettupalayam (from certain parts of the Coimbatore District) and thence to Palghat by rail.

A bullock cart holds 12 to 16 bales of 125 lb. each and the transport rates during normal times in two specific instances are given below.

TABLE II Rates for transport by bullock carts.

From	To	Distance	Rate per bale of 125 lb.	Bales per cart	Rate per bale per mile run
Satyamangalam	Palghat	75 miles	Rs. 1—8—0	16	3·80 pies
Pollachi	Do.	35 miles	Rs. 0–10—0	12	3·43 pies

Freight charges are met by the assembling merchants as stipulated for in their contracts, or are borne by producer cum curers who sell the produce to these assembling middlemen.

Curing for the market Sun and pit curing are the two methods generally adopted to cure chewing tobacco. But only the sun-cured tobacco is sent to the Palghat market. A brief account of the method is detailed below:—

1. The crop is harvested in the evenings and are left in the field itself.

2. Two or three days after the harvest plants are hung up on poles fixed horizontally inside *pandals* erected in the field. They are left in the shade for 15 to 20 days, until the midrib turns yellow. During this period once in every four days the plants are disturbed in the morning so as to expose fresh surface to the action of the air. If weather be dry, the floor is moistened with water.

3. About the 20th day after hanging on the poles by which time the leaves turn completely yellow, the plants are removed and heaped in bulk, square or rectangular—locally termed *Ambarams.* This is disturbed once in three or four days and again reheaped to slow down the fermentation. Sometimes it is weighted with stones and allowed to ferment for a further period of two to three weeks.

4. After this stage the leaves develop a strong aroma. The leaves are now stripped, sorted and tied into hanks of 6 to 12 leaves, locally called *Kanni* or *Mothai.* They are then baled and kept in store.

5. If the tobacco does not develop aroma, the heap is left undisturbed for a week or more. And in some cases when the quality is low, the hanks are dipped in a solution of palmyra jaggery in brackish water got from the specific wells called 'tobacco wells'. Such wells are of great renown in the Coimbatore District.

There is practically no curing done at Palghat, and only in some cases are curing experts taken from Palghat to the producing centres. Carelessly cured or low quality stuff gets a treatment with palmyra jaggery solution in brackish water. For this purpose, merchants usually procure water from the renowned 'tobacco wells' of Coimbatore, as they believe that this water improves taste, flavour and aroma of low grade tobacco. The most important operations of processing at Palghat are repeated bulking, heaping and lying.

There is a wrong notion that tobacco brought from the Tamil districts is treated at Palghat with horse's urine to increase aroma and flavour. For the matter of that, any decomposing organic matter gives off ammonia, and the pungency of ammonia combined with that of nicotine in the tobacco emits a strong odour, and this might have misled the people into thinking otherwise.

Packing materials The material used for packing is mat made of the leaves of the date palm or the sago palm, the latter growing luxuriantly in Malabar. Mats are got from the Mysore State also. The ropes used for binding are from the fibre of the stem of (*kytha* - Mal., *thazhai*—Tamil) *Pandanus* Sp. growing wild in the coastal regions of Malabar. Two mats of dimensions 5 ft. 6 in. by 4 ft. are required to pack a bundle of 125 lb. of tobacco (both the mats together weigh about 5 lb). Each mat costs 2 annas and about 2 annas worth of fibre is required to tie each bundle (6 annas per bale—pre-war rates). The cost of packing materials is borne by the assembling party.

Changes in quality and quantity during storage As regards the changes in quantity, cured tobacco fresh from the curing place is not completely rid of the moisture and so storing results in a loss of weight. This loss is more during the first few weeks after curing. It has been noted at Palghat godowns that the bales brought during the beginning of the season, i. e., April—May decrease in weight by five to six lb. per bale during the first week and one or two lb. per week during the next two weeks, and thereafter the loss in weight is almost negligible. But a consignment received during later months, i. e., July—August, does not lose weight so significantly, due to the high humidity and slow evaporation. Quality, flavour, taste and aroma improve by aging, i. e., in storage with repeated bulking for a long period of one or two years. Acting on this principle, there is, in parts of Malabar a practice of storing inferior tobacco under paddy in wooden bins, called *Patthayam,* to improve its quality. The produce, when it once leaves Palghat for the coastal areas, improves in quality. This is attributed to the tobacco absorbing the sea breeze laden with moisture, containing traces of mineral salts. Thus it is believed that tobacco of the Ponnani Taluk is better than that of the Palghat Taluk markets, the former being nearer the coast.

Pests and diseases in storage The tobacco borer beetle—*Lasioderma sericorne*, fam. *Anobeidae*, is a serious pest of tobacco in godowns, where produce two or three years old is kept. The grub, the larva of the beetle and the adult are voracious feeders of the stored produce. But fortunately, this does not turn out to be a pest on produce fresh from the curing shed. A mould like a bird's eye with a dot in the middle with a tendency for perforation is a serious disease of freshly stored tobacco. This is as much dreaded as small pox in human beings. Incidence of this is common during all seasons and is at the maximum this year.

Grading At the place of curing, after stripping, the leaves are graded and then only tied into *kannies.* Grades are designated according to the colour differences, and colour mainly denotes quality.

Chewing Tobacco Grades

	Meenampalayam	Thenmukham (Udumalpet)
Grade I	Bright—good texture, body and aroma.	Bright—good texture, body and aroma.
„ II	Light Brown—Medium texture, body and aroma.	Light Brown-Medium texture body and aroma.
„ III	Light Dark and Heavy Dark—Tough, heavy body and low aroma	Light Dark—Medium texture body and aroma.
„ IV	...	Heavy Brown—Tough, heavy body and low aroma.
„ V	...	Heavy Dark—Tough, heavy body and low aroma.

The brightest tobacco indicates maximum aroma, flavour, taste, nicotine content and good texture. There is a deterioration in quality with the fading of colour. The consumers of the Kerala territory require different qualities with different percentages of nicotine content. It is denoted by the colour of the leaves, the bright ones contain the maximum and the heavy dark ones the minimum. There is no strict specification or standardisation fixed for sorting the cured produce; and there is no legislative provision for this such as the Commercial Produce Grading and Marketing Act. Superior quality Bright bales often contain various other grades in the same *kanni*, such as inferior Heavy Dark, and slender leaves, or diseased and aphid-infested leaves. In the interest of honest business strict grading is necessary.

Assembling Tobacco grown in the Tamil districts is drawn to Palghat by a system of financing the cultivators in advance to aid cultivation. The rich Rowthers and some of the Hundi merchants belonging to the Brahmin community are interested in the business and they or their agents tour the centres of production and finance the cultivators. Some of them lend money at or below 12 per cent interest to their agents, who distribute smaller loans in turn to the producers, at rates ranging from 12 to 25 per cent. These agents are assembling merchants who are responsible for drawing the produce to the market at Palghat. Those cultivators who are in need of money receive the loan and enter into contract to sell the produce to their creditors at stipulated prices which are definitely lower than the prevailing market price, while impecunious *ryots* are so tied to those who advance loans. The well-to-do *ryots*, especially the rich Gounders of the Coimbatore District demand of the merchants an advance of 10 per cent of the price fixed and ask them to enter into a contract to buy the produce not later than one month from the date of transaction after which they forfeit the right to purchase. In the agreement which is sometimes unwritten the price specified is that ruling at the producing centre and the ruling prices are Rs. 150 to 200 per bharam for the Meenampalayam and Rs. 80 to 100 per Bharam of 500 lb. for the Thenmukham variety. It is only in rare cases that the *ryot* deals directly with the commission agent

at Palghat. Brokers play a very important part in distributing loans and getting the produce to the market.

Warehouse and commission agents The tobacco thus assembled is stored in the warehouses owned by the commission agents. There are thirty commission agents at Palghat. Twenty are first class agents with provision for storing more than two thousand bales; the rest are agents who have not facilities for such large storage and who cannot finance the grower on any considerable scale. The main function of the commission agent is one of financing the grower, the assembling merchant, and the wholesale purchaser. The total investment in the tobacco trade in Palghat is estimated to be about ten lakhs of Rupees per annum, and the entire capital is found locally.

According to the Madras Tobacco Taxation Act of 1939, the commission agents have to pay a tax varying on the annual turnover — Rs. 6 for sales up to Rs. 200, Rs. 12 from Rs 200 to Rs. 400, and above Rs. 400, 3 per cent for the first Rs. 400 and 10 per cent for the rest of the turnover value. But this has been repealed by the Tobacco Duty Excise Act of 1943 of the Government of India. The tax is now levied not on turnover, but on the quantity of tobacco stored for sale. (A licence fee of Rs. 5 for a maximum of 500 maunds of stored tobacco, Rs. 50 up to a maximum of 2000 maunds, and a maximum of Rs. 100 above 2000 maunds.) Further, according to the Act an excise duty of one anna on every pound of tobacco has to be paid before dealing in the commodity and storing it in private warehouses. If the duty is not paid the commodity has to be kept under the direct supervision of the Excise Department. Such warehouses are called 'Bonded warehouses.'

Disposal of the produce The wholesale merchants from the different parts (mentioned in Table No. VII) visit frequently the assembling market and select and purchase their requirements from the commission agent. The assembling merchant at whose risk the whole produce is stored and sold is seldom present when the deal is made, but depends on the commission agent who gets a percentage as commission. The sale is in most cases on a credit system. The purchaser enters into a contract with the commission agent to buy a certain amount of produce at a certain rate and to pay the money within fortyfive days from the date of the transaction, in default of which he undertakes to pay interest on the sale price at 12 to 25 per cent. The commission agent gets a commission of 9 pies per rupee of the sale price. The risk of the assembling merchant is now over and the commission agent credits the sale price to the account of the former and takes the responsibility of collecting the money and the right to collect the interest by dealing directly with the purchaser.

Finance and financing Practically all the finance amounting to 10 lakhs of rupees comes from the Rowther community and the Hundi merchants of the Brahmin community. By virtue of their monopoly and long experience gained in the trade they are able to forecast the trend of prices and demand in the market, and to estimate the yield and probable value of the

crop in the field. They take advantage of the indebtedness of the producer and thrust money on him as though to oblige him in times of need, while he really is obliged to sell his produce to the creditors at a rate lower than the prevailing market price. This system is attended by the evils of forced sale of produce, under-rated prices and extortionate rates of interest ranging from 12 to 25 per cent ; and in some cases there is a bad practice of immature harvesting to expedite sale of produce and to satisfy the pressing demand of the money lender. This reduces the quality and value of the produce and this is detrimental to the *ryots'* interest. With all the glaring disadvantages of the present system the *ryot* is attracted and tied firmly to these money lenders. This is due to their readiness and elasticity in dealings as contrasted with co-operative and other joint stock organizations, although co-operation in its application to agricultural marketing no doubt possesses certain merits over the present system.

The commission agents take little or no risk as tobacco commands a good sale as it is not grown in the West Coast. In addition the assembling merchants bear the risk of market vagaries, minimising thereby the risk to the commission agent. The commission agent is also responsible for financing the wholesale purchaser. Though the market vagaries and financial stability of the *ryots* do not affect him, he has sometimes to meet with arrears and insolvency of wholesale purchasers. There are not wanting instances of this kind.

Fixing prices Prices are fixed by negotiating a rate for the day or week for I grade Meenampalayam No. 1, and lower grades are sold at correspondingly lower rates. In fixing prices there is no public bidding or even open bargaining. The commission agent and the wholesale dealer negotiate the price secretly by bringing their palms under cover of a cloth and denoting the prices each desires to fix with his fingers, to avoid a second person knowing it. So the price varies from customer to customer.

Sale season Unlike in many other commodities the demand for tobacco at the Palghat market is at the maximum during the importing months. From September to February there is a lull in the trade and price.

TABLE III **Yearly average prices per Bharam of 500 lb. (wholesale) and retail per lb. of Meenampalayam No. 1 and Thenmukham (Udumalpet). No. I chewing tobaccos at the Palghat Tobacco Market**

Year:	1937–38	1938–39	1939–40	1940–41	1941–42	1942–43	1943 May
Meenampalayam No. 1	**Rs. as.**	**Rs. as.**	**Rs. as.**	**Rs. as.**	**Rs. as.**	**Rs. as.**	**Rs. as.**
Wholesale	207 8	213 8	189 2	227 4	268 13	297 9	400 0
Retail	7 as.	7 as. 3 ps.	6 as.	8 as.	8 as. 6 ps.	9 as. 3 ps.	14 as. to 1 Re.
Thenmukham No. 1	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs.
Wholesale	103 10	96 11	105 6	126 2	144 7	174 12	250
Retail	3 as. 3 ps.	3 as.	3 as. 6 ps.	3 as. 9 ps.	4 as. 9 ps.	5 as. 10 ps.	8 as.

TABLE IV Monthly average prices of chewing tobacco (per Bharam of 500 lb.) at the Palghat Tobacco Market

Month	Meenampalayam No. 1 Average for 5 years ending with 1941-42		1942-43		Thenmukham No. 1 Average for 5 years ending with 1941-42		1942-43	
	Rs.	as.	Rs.	as.	Rs.	as.	Rs.	as.
April	220	2	296	14	117	11	176	13
May	223	9	304	10	117	13	177	2
June	226	5	305	1	118	14	180	1
July	231	4	298	15	118	6	179	11
August	229	5	297	6	118	11	178	11
September	226	13	296	13	113	9	173	0
October	221	6	295	14	113	2	172	13
November	219	15	294	11	113	14	171	14
December	214	4	293	15	112	12	172	6
January	213	14	294	9	112	10	171	11
February	213	8	295	12	112	9	171	8
March	214	11	296	1	113	9	171	1
Average	221	4	297	9	115	4	174	12

Prices fluctuate very much as the above tables indicate. The present price of first quality bright Meenampalayam is Rs. 400 per bharam of 520 lb. and that of Thenmukham No. 1 is Rs. 250 per bharam. The price of tobacco in this market has not been shooting up as high as that of other commodities in spite of the war. At present (May 1943) prices are tending to rise. This is perhaps due to the decreased supply of tobacco consequent on the *ryots'* preference for cotton, which gives a better return now. The pressing need to grow more food crops is another reason for the shrinkage in the area under tobacco. In future cultivation of tobacco is to be taken up under the direct supervision of the Excise Department and illiterate *ryots* never want to take the risk so long as at least the cotten crop will fetch a decent remuneration. So speculating on this, merchants have begun to store the produce to meet the demand during the next year.

The prices of tobacco vary from month to month though not sharply as may be seen from table IV. The price is very low during December, January and February and increases from May onwards.

Marketing services and their remuneration 1. *Melal or Dhellal commission* Brokers who bring purchasers to the wholesale market receive a commission of 4 as per bale from both the parties (i. e. buyer and seller).

2. *Tharakumandi commission* For the sales effected the commission agent gets a commission of 9 pies per rupee of sales. This is paid by the seller merchant.

3. *Vandimothai* The servants and cart drivers get a pound of low quality tobacco as remuneration for their labour. This is borne by the seller.

4. *Theenpukayila* The purchaser gets about a pound of tobacco as specimen for chewing. This is also borne by the seller.

5. *Tying and weighing charges—Kettucooly.* The purchaser pays the servants at the rate of 1 anna 6 ps. per bale for tying and weighing the bundles, and also one to two annas worth of low quality tobacco stripped from

the hanks. This is called *Oorupukayila* which means cast-off tobacco. If the bales have to be repacked and rearranged they have to be paid an additional remuneration excluding the cost of mats and ropes at the wholesale purchaser's cost.

6. *Vaida or Thavanai* The seller allows the wholesale buyer a period of 45 days from the date of transaction to pay the purchase price. Thereafter interest is charged at from 12 to 25 per cent. But in case the purchase money is paid at once or before the lapse of the period of grace, the seller gives a rebate being the interest on the purchase price for the period not lapsed. This is said to promote cash payments being made in some cases. This is known as *vaida* interest. *Vaida* means period and it is usually 45 days.

TABLE V. Trade Commissions etc. at the Palghat Tobacco Market.

Particulars	Paid by Seller		Paid by Buyer		Unit charged for
	Rate	To whom paid	Rate	To whom paid	
1. ***Melal*** or ***Dhellal*** commission	4 as.	Broker	4 as.	Broker	Per bale of 125 lb.
2. ***Tharakumandi*** commission	9 ps.	Commission agent	...	...	Per rupee of sale price
3. ***Theen pukayila***	One *kanni* or hank of 6 to 12 leaves tobacco	Buyer	...	...	Per bale of 125 lb.
4. ***Vandi-mothai***	Do. (inferior quality)	Menials & servants	...	...	Do.
5. ***Kettucooly***—Tying and weighing charges	Do.	...	1½ as to 3 as.	Servants	Per bale of 125 lb higher rate if rebulked and repacked.
6. ***Oorupukayila***	...	...	1 or 1½ as. worth of inferior tobacco	Do.	Cast-off tobacco for remunerating servants for their labour in addition to wages
7. ***Vaida*** (interest)	12 to 25 per cent as per purchase terms	Buyer	...	...	...

Retail sales of tobacco in Palghat In addition to the commission agents there are a number of wholesale merchants and retail merchants who deal in tobacco within the town. The retailers get their supply from the wholesalers. In addition to it they receive from the servants and others at a low cost the cast-off or inferior quality stuff earned by the latter as presents or wages in kind. This is the kind of stuff which meets the demand of the working classes and other poor consumers in the town.

Distribution and centres of consumption Merchants from Cochin, Travancore, Cannanore, Tellicherry, Calicut, Tirur, Madras, Madura and Mangalore visit the market and purchase their requirements. Tables VI & VII show the particulars of the grades purchased by the various centres and their percentage distribution. Every year about 85 per cent of the imported produce is sold away and the rest is carried over till the end of the second or the third year, and then sold off

TABLE VI **Distribution of different Grades of tobacco and consuming centres of Palghat chewing Tobacco**

	Meenampalayam	Thenmukham
Grade I	Palghat, Cochin State, Mangalore, Madura, and Madras	Cochin State
Grade II	Cochin State, Travancore, Tirur, Chowghat and Edapal	Travancore
Grade III	Calicut and Cannanore	Tirur, Tellicherry, Wynad, Edapal and Chowghat
Grade IV		Calicut
Grade V		Cannanore

TABLE VII **Centres of consumption and percentage of distribution**

Centres of Consumption	Percentage of distribution
1. Tranvancore State	26.0
2. Cochin State	24.0
3. Cannanore	8.4
4. Calicut	8.4
5. Tellicherry	4.2
6. Tirur	2.7
7. Madura, Mangalore, Madras etc.	1.3
8. Local consumption including shandies & retailers in the taluk	25.0
Total	100.0

The Palghat Leaf Tobacco Merchants Association This is an association organised to protect the interests of the commission agents. They assemble and discuss matters of common interest mainly about the financial stability, solvency or otherwise, regularity in dealings and reliability of the various assembling agents, wholesale purchasers and brokers. Thus they determine the limit to which every individual could be financed without risk. This prudent policy prevents dealings with insolvent merchants and beyond their capacity to repay. Over and above this the association functions as an organ to represent their grievances to the Government and railway authorities.

The Tobacco Excise Duty Act 1943 The various clauses of the Act restrict the cultivation of tobacco as an excise crop like ganja or opium subject to licencing and supervision of the Excise Department; and an excise duty of one anna per lb of cured tobacco is to be paid by those who deal in tobacco (and not the cultivator). This year even during the heaviest season i. e. from April onwards the dealing has been considerably curtailed.

Though tobacco could be stored in bonded warehouses (and duty paid at the time of sale) merchants do not want to take the risk of penalisation, for tobacco loses in weight considerably and this sometimes out-runs the limits provided in the Act under 'Loss in weight' as the excise duty increases the price of every pound of tobacco by one anna, payment in kind is withheld for certain items of services (mentioned in table V.); for, those who store in bonded warehouses cannot at all utilise the tobacco for payment in kind. This directly tells upon the poor servants and menials who used to get three to four annas worth of tobacco per day. These have tended to raise the rates of interest on which money is lent for assembling and purchasing purposes.

Importance of Specialists As stated above the commission agents are experts in financing cultivation, in assembling the cured produce directly or through deputies, processing, curing, grading, sorting and identifying the grades. They play an equally important role in financing wholesale purchasers who buy the commodity on a credit basis. In short, these are important functionaries in all the stages from production in the field to consumption. They have been enjoying a monopoly in this trade for over a century. But for them the consumers of tobacco in the Kerala territory might have to go without chewing tobacco suited to their tastes.

Conclusion It is a matter for some satisfaction that the grower gets 55 to 65 per cent of the consumer's price in spite of the toll collected by so many middlemen. It is hoped that the market can be better organised and improved by the application to tobacco of the Commercial Crops Marketing Act followed by standardisation of units and weights, licencing the hosts of middlemen and restricting their control on the *ryots*, making provision for warehouses and regulation of the trade commission and other charges.

There is no co-operative loan and sale organisation at present. Such an organisation is bound to improve the present system of financing and marketing. But considering the long distance between the centres of production and consumption and the difficulty of judging the quality of different kinds of tobacco and the heavy sums involved in financing the cultivator and the wholesale purchaser it would be too optimistic to think of achieving a perfect co-operative organisation in the near future. However a stage has reached when the State should undertake to reorganize and minimise the evils of this system of financing the producer.

It may be said that tobacco is, after all, a luxury, but it has also become a habit, a second nature and a necessity with the consumers. The practice of chewing is on the decline with the younger generation, its place being taken up by other forms of tobacco, especially cigarettes. Let not jurists grudge the working classes, especially in rural areas, this little luxury.

Acknowledgment I take this opportunity to express my sincere gratitude to Sri S. V. Duraiswami, B.A., B. Sc. (Ag.) Assistant Lecturer in Agriculture, for his kind guidance and direction in the conduct of the investigations

and for his valuable suggestions and criticisms on this report. I am also greatly indebted to Janab K. A. Sheik Rowther, Commission Agent and Secretary of the Palghat Leaf Tobacco Merchants' Association for the valuable information he furnished and the help he rendered during my investigations.

Reference:

1. Gopalakrishna Raju, K. and Venkataramanan, S. N. (1941) *Report on the Marketing of Tobacco in the Madras Presidency*, Govt. Press, Madras.
2. Ramakrishnan, K. C. (1930) Financing and forced sale of produce, *Madras Agric. J.* 18, 111-120.

India Must Grow More Food*

By Sri V. N. SUBBANACHAR

District Agricultural Officer, Anantapur

It is almost an year since we met last for a similar purpose. As you are all aware, we have turned the corner and started pounding the Axis. Last week, Italy dropped her pilot and Mussolini left the scene. While we are happy and hopeful about the outcome of the War, our living conditions have been causing much concern to the public at large and the Government. We have had a year of famine. Our food production had been insufficient to meet the demands. At the same time, unscrupulous people hoarding the grains without consideration for the starvation around them, have created difficulties by reducing the supplies in the market.

The cry for food is great. The responsibilities of the Agricultural Department have become heavy and we are striving our best to increase the food supplies. We are trying to expand cultivation by bringing uncultivated lands under the plough. The *ryots* are permitted to grow grain crops on these lands free of assessment. Favourable terms for food cultivation as, free cultivation of tank beds with vegetables and certain dry crops when there is no water in the tanks, the cultivation of railway lands under reasonable rental, and free cultivation of backyards with dry food crops and vegetables, have been offered. We are offering free seeds and manures to poor *ryots*. We have opened our purse wide and are granting loans for sinking new wells or repairing old ones and making them fit for use. Government have granted remission of assessment for three years for the cultivation of food crops under such wells and have said that *ryots* may begin repaying the loan from the fourth year onwards. We are granting loans free of interest for purchase of manures and improved seeds up to a maximum of Rs. 50 in each case. With such a large number of concessions, Government have put before you the opportunity for growing more food crops and feeding the hungry people.

To understand properly the need for increased food production, it is necessary to know something about the peacetime situation. The principal food grains in our country are rice, wheat, *jonna*, *sajja* and grams, which

* Lecture delivered on 1—8—'43 at Anantapur, during the inauguration of the 'Tree Planting cum Grow More Food' week.

between them, account for 80% of the total production of food crops in India, estimated to be about 600 lakh tons. Their shares are rice 265, wheat 102, *jonna* and *sojja* 92 and grams 35½ lakh tons a year. In normal years, India is self-sufficient in respect of her food requirements except for about 14 lakh tons of rice representing a little over 5¼% of the total rice production and about 2½% of the total food production of the country as a whole. Until the loss of Burma, we had been importing this quantity of rice.

There is now a gulf between the food that is produced and the actual requirements of food. We are trying to bridge the gulf by the application of agricultural science. The preservation of soil from loss by erosion, the application of well preserved and quality manures, and the use of improved seeds of crops are the three pillars on which the bridge rests. Over wide regions of the world, in the prairies of America, the steppes of Russia, and the bleak treeless expanses of our own Rayalaseema, continuous washing away of the surface soil has caused irreparable damage and immense losses. On an average, there is a loss of about 2% of land due to erosion, and considering only the black soils of this district, taking an average value of Rs. 100 to the acre, the loss to this district is to the tune of over 10 lakhs of rupees, or taking the annual rental value at Rs. 10 per acre, the loss to the *ryot* by rental is about a lakh of rupees annually. What can a *ryot* do if his wealth of surface soil is washed away leaving the less fertile or rocky subsoil only to be cultivated with crops? That is what is happening around us. In a *ryot's* life-time of 60 years, it is estimated that three inches of fine valuable surface soil is washed down into the *vankas*, and what will the future generation get but mere land without soil. Any amount of manuring the land can never make good the loss of soil that takes place year after year. The control of soil erosion is as important as anything else in agriculture and he who declines to regard this as a problem to be solved is not a good *ryot*. And, as long as the problem is left untackled, we are bound to lose by the much of reduced yield. Big and permanent bunds over large blocks of land, and smaller bunds in between is a solution to the problem. Bunding of the fields should become part and parcel of the *ryots'* practice like the other field operations as ploughing or working *guntaka*.

In the matter of manure, the potential loss to the country due to improper preservation of cattle manure is estimated at 600 lakhs of rupees. Just think of it and think of the number of fighter planes we could give with this amount. 600 lakhs of rupees worth of manurial matter is lost by disregard of the elementary principle that the cattle dung and urine should be kept preserved in covered pits. Consider how much increased food we can grow by applying all this manure to our fields. Here we are in a pretty situation, with a lack of food on one hand and wasting manure on the other. Then there are thousands of acres of paddy land that are hungry for green leaf manure. *Ryots* are spending Rs. 10 to Rs. 12 per acre for fetching green leaves from outside while they could actually grow it easily in their own lands. Already in this province, there are over two lakhs of acres of

paddy manured with green manure crops as sunnhemp, daincha and *vempali*, putting a profit of over 10 lakhs of rupees in the *ryots'* pocket, by producing about 5% increased yield. In our own district, there are about $1\frac{1}{3}$ lakhs of acres of paddy which could be made to yield 65,000 bags more paddy, or as much as 5,000 tons, by a judicious use of green manures and other manures like bone-meal and superphosphate. Considerable areas of stiff and alkaline lands in our district could be improved by growing daincha on them. There is a difference in yield of at least 5 bags of paddy per acre between a normal good soil and an alkaline soil. In our district of Anantapur, there are a number of groundnut expelling factories that produce oil cakes. These cakes are very good manures for paddy. For those *ryots* who are not in a position to purchase and apply them, Government are ready to grant *takkavi* loans for the purpose. It may interest you to know that several hundered tons of cakes from these factories are sent to Bombay and the southern districts for the very purpose of manuring paddy that is so neglected here.

Then there is the seed. Apart from the benefits of proper manuring, the improved varieties of seeds alone are capable of enhancing the yields of crops from 10 to 20 per cent. There are improved strains of *jonna, ragi, sajja, korra* and paddy that are used by *ryots* to a certain extent already in this district. The increased output of food grains by their use last year was nearly 1,500 tons in this district inspite of the failure of the season. In paddy alone, there are 70 improved varieties suitable for different conditions prevailing in the Presidency and these strains occupied more than a sixth of the total paddy area of this Province. At a modest estimate of 10% increase in yield, the use of improved strains of paddy alone would add to our food by over a lakh of tons of rice. If along with improved strains, better manures are applied, there is no doubt that 20% increase could be obtained.

All the improved methods of increasing food production would be of little avail, if the damage by insect pests and diseases are not prevented. To mention only one instance, the smut on *jonna* is responsible for a considerable loss of grain annually. This loss could be prevented by a cheap remedy costing less than three pies per acre—the use of sulphur on the seed before sowing. A few thousand acres of *jonna* are being treated every year by the Department, but more and more *ryots* should adopt this treatment and save their crops from unnecessary loss. By carelessly storing grains, by storing them before they are completely dry, insect damage is encouraged. Due to one insect alone, the stored paddy in this province is estimated to suffer a loss of nearly a crore of rupees annually. This represents so much loss of food grain which would otherwise feed a large population. In a similar manner, rats have been estimated to damage our grains to such a large extent annually that it has been calculated to be a rupee per head of the population. This is not a small amount and while we know that rats are also responsible for the frequent outbreaks of plague, it is all the more necessary that every step should be taken to destroy them.

While mentioning food crops, it is necessary to remember the pulses like redgram and Bengal gram. There is an increasing demand for these products and more production is needed. It would be an easy matter to mix redgram with groundnut. It is also a good practice to sow redgram on the bunds in paddy fields and thus utilise the bunds to the best advantage.

Food habits need also to be overhauled to meet the situation. We should make the best out of our present rice and wheat stocks. Milling of rice and wheat leads to the loss of vitamins. Polished rice is deficient in vitamin B and so also is wheaten flour *(maida)*. Hand-pounded rice is more wholesome and nutritive, besides giving about 4% more of rice than what the same quantity of paddy would give by machine hulling. A mixed diet comprising wheat, rice and millets is found to be better balanced than one based only on a single staple food, for example rice or wheat or millet. As none of the food grains can provide all the nutritive requirements, the inclusion of fresh vegetables in our diet to supply the minerals and vitamins is a matter of importance.

The Grow More Food campaign going on right through the world includes the growing of vegetables to a great extent. When an industrial country like England has brought under the plough more than a million acres of open spaces, lawns, and even tennis courts for growing vegetables, one could realise the necessity for our little effort to this great work. For, the duty of the civilians is no less important than the duty of the armed forces in the prosecution of the war, and the man or the woman who grows a patch of vegetables is as much a war worker as those who are in the battle fields. Those who have not got even that small plot of land, could also help in growing vegetables in baskets, broken mud pots or boxes of earth on verandahs or even roofs of houses. Vegetable growing is a simple matter. It is a hobby which every man and woman could easily take up. There is a pleasure in producing one's own vegetables. It is an occupation which is at once useful and healthy, and then you have the satisfaction of having helped the war effort. A home garden is therefore a victory garden and it is a pleasant occupation for the whole family since even the children can help. There cannot be an excess of vegetables even if every one of us starts growing them tomorrow. We ourselves require a lot of vegetables in our diet, as many of us are really not well nourished and could improve by adding more vegetables to our menu. At the same time, you will find that you cannot take as much grain food as formerly and thus the grain stock lasts longer and goes a little further.

This is bridging the gulf between scarcity and abundance. Those who own lands owe a duty to the landless to produce food. It is almost a crime to produce less food where it is possible to grow more of it. It is a crime against society to leave a well unused or a land fallow. The demands of the population are great. The opportunity for producing more food is equally great. Let us all set forth and help to our utmost in producing more food. Let us fight for the third freedom, the freedom from want. Food will win the war and write the peace.

The Story of Ginger

By E. R. CHELLAM VINCENT, Student,

Agricultural College, Coimbatore

Would you not like to know about the romance of ginger other than the stereotyped information about its cultivation and marketing ?

A considerable number of people in England make their living by distilling essences from ginger. So does every mineral water maker. Ginger has a story which reaches back to the long forgotten past. " It has associations which make the story of George Stephenson and the romance of the founding of Marine Insurance by the Italians."

Let us trace the word 'Ginger' back through ages and see what the philologists have to tell us :—

Modern English	— ginger
Old English	— gingiber
French	— gingembre
Latin	— zingiber or zingiberi
Greek	— zingiberis
Arabic	— zingibil
Hindustani	— zunjubeel
Sanskrit	— Sringa vera (horn shape)
Tamil	— Injgi

Thus the interesting fact is established that the early Hindus described it by comparing it with the horns or antlers of certain animals. A glance at a fully grown piece of ginger will easily prove the aptness of the name.

The following information would enable any one to deduce many interesting facts about ginger. We can see, for instance, that the ancient Romans and Greeks knew this wonderful spice. We find corroboration of this in the pages of the Roman historian Livy who believed that ginger came into Europe from Arabia by way of the Red sea. Moreover as Sanskrit was a dead language as early as the 3rd century B. C., it follows that ginger must have been known and used over two thousand years ago, establishing the claim of antiquity.

The fact that there is a word for ginger in old English also shows that the English forefathers knew and used this spice. But we have more precise information than this. Ginger is often referred to in the Anglo-Saxon leech-books of the 11th century, that is, before the Norman conquest.

Apparently then the medicinal virtues of ginger have been recognised even in England for at least 900 years. Its use has persisted to the present day with the sanction and approval of the medical men of every age, country and nationality.

Ginger root is frequently mentioned in the history of the Middle ages. It was an important item of commerce between East and West. Documents

exist to prove that it was included in the tariffs levied at Acre in Palestine in 1773 and at Barcelona in 1211, Marseilles in 1228 and Paris in 1296.

In the 13th and 14th centuries it was in very common use, being next in value only to pepper. Indications are not lacking that the acquisition of these valuable spices played a considerable part in the Crusades, as a motivating factor.

The Elizabethan historian Gerarde writes 'our men which sacked Domingo in the Indies digged up ginger there in sundry places wilde......... Ginger groweth in Spaine, in the Canerie Islands and the Azores. It is most impatient of these our northern regions, as myself have found by proofs for there have been brought unto me at seuerall times sundry plants there of,, fresh, green and full of juice, which have sprouted and budded foorth greene leaves in my garden in the heat of somer; but as soon as it hath bin but touched with the first sharp blast of winter it hath presently perished both blade and roote.'

Leaving the historical associations of ginger aside for a moment, let us consider the root itself. What we know under this name is the rhizome of *Zingiber officinale*, a perennial reed-like plant growing from 3 to 4 feet high. This plant rarely flowers and the fruit is unknown. It is not found in the wild state but is believed to be a native of the warmer parts of Asia from where it has spread to the West Indies, S. America, Western Tropical Africa and Australia.

In commerce ginger is used in various forms. As a spice or a flavouring agent it has been always popular and one may safely prophesy that it will always be so. It finds a way into the confectionary (gingerbread etc.), and it is eaten as a sweet (crystallised or preserved ginger). We should not in this connection forget the *Injimuraba* and the *Sukku karuppatti* of the Tinnevelly District prepared with ginger and jaggery. Ginger is largely introduced as the main flavouring constituent of aerated waters, ginger beers, cordials, wines, etc. The principal varieties of ginger are from Jamaica, Cochin, Africa, Ceylon, Malabar and Barbados, the two first named being the most used for the various ginger drinks.

The medicinal values of ginger have long been recognised. Its principal constituents are (1) starch, (2) a volatile oil to which its characteristic aromatic odour is attributed, (3) gingerol to which it owes its pungency and (4) resin.

The flavouring principles were first made completely soluble by Mr. William Hay of Hull, England, some 50 years ago. In medicine ginger is mainly used as a stimulant and carminative. Ginger is put to a score of medicinal uses in India and it is one of the plant products always exploited by ayurvedic and allopathic doctors to cure patients. For the production of non-alcoholic drinks the ginger root is being almost entirely superseded by ginger essences. A beautifully clear ginger ale or ginger beer is very common now-a-days. Of course its fore-runner the cloudy 'Stone' ginger beer is still popular in parts of England.

SELECTED ARTICLES

A new method for estimating the Fertilizer Requirements of Citrus Trees

By A. C. BATHURST,

Division of Horticulture, Pretoria

[The fertilizer requirements of crops are ascertained by (a) field experimentation and (b) soil analysis. The author has been experimenting with a new method promising to be cheaper and quicker than the field experiment and more accurate and reliable than soil analysis.

Field experiments are accurate but slow, and costly and beset with a number of limitations: (1) The field should be uniform, (2) The field should be large enough to accommodate the desired number of repetitions of the various treatments and (3) The experiment should be conducted for a number of years for eliminating residual effects of previous fertilization and seasonal effects and for studying the after effects of the treatments themselves.

Soil analysis is cheap and quick, but the results obtained are vague. Various methods of determining the soluble plant food in the soil are in vogue. The results obtained need not necessarily represent what actually the various crops could extract from the different soils. Abstract of the first part of the article. Ed.]

Plant Analysis: A new and promising method The idea of analysing a plant to determine its fertilizer requirements is not strictly speaking, a new one, since it was first suggested some sixty years ago. For various reasons, however, chiefly due to unreliable sampling methods, poor analytical methods, faulty methods of drawing conclusions, and lack of knowledge of basic principles governing plant growth, the method did not become popular. It may be of interest, however to quote briefly from a recent paper by two of America's leading plant physiologists, who recently received the annual thousand dollar award granted by the American Association for the Advancement of Science for a very notable contribution to science for the year 1940. The authors Drs. Hoagland and Arnon, state: 'The idea of analysing plant tissues in the study of nutrient deficiencies is a venerable one, but we gain the impression that there is a renewal of interest in this approach.........' In experiments with barley and tomato plants there was a high correlation between percentages of potassium in the dried vegetative tissues, and the response of the plant to potassium fertilization. The possibility also exists of sometimes obtaining useful indications of potassium supplying power of soils from analysis of samples of plant tissue taken at suitable stages of growth from plants growing in the field.

It is precisely this aspect, namely the relationship that has been found to exist between the amount of a certain plantfood found in a plant, and the response it will show to applications of that plantfood that is the basis on which the 'Plant Analysis Method' is founded. While in soil analysis we extract the plantfoods with water, acids, or other chemicals, we can never be sure that what we get out of a soil is the same as what the plant would get out of it. By analysing the plant however, we are taking a short cut as compared with soil analysis, since we use the plant itself as the means of removing the plantfoods from the soil. Theoretically speaking, this method of approach should take us a big step nearer the heart of the problem. By making a large number of analyses, both of healthy plants and also of plants known to be suffering from definite shortages or excessive amounts of various plantfoods, we can eventually find out with

very fair accuracy how much of each of the essential plantfoods a healthy plant of any particular species should contain. This has actually been done in the case of various field crops over widely varying conditions in the U. S. A., Great Britain and Sweden, with encouraging results. To sum up the findings from these countries we may state that regardless of the climatic and soil conditions the chemical composition of the healthy plants of a certain species varied only within a very small range, and also all plants containing less than normal quantities of any particular plantfood usually responded to fertilizers containing that plantfood. The evidence available suggests very strongly that it should be quite possible, by means of plant analysis, to predict the main fertilizer requirements of any plant, no matter what the soil and climatic conditions may be. This is something which soil analysis cannot do for neither the individual requirements of the plant, nor the plantfoods which it can actually take up, nor the prevailing climatic conditions are taken into account.

Predicting the fertilizer requirements of citrus During the past four or five years, the writer has laid down several large fertilizer experiments on citrus in various parts of the Union. The objects were twofold: firstly, to find out by trial and error the best fertilizers for Valencias under each of the different soil and climatic conditions, and secondly, to discover just how the amounts of the various important plantfoods in the trees were affected by the various soils and the fertilizers given. These experiments have now provided some valuable information which may be summarised as follows :—

In an orchard in the eastern Transvaal striking improvements in yield—two or three times the yield of unfertilized plots—followed annual applications of nitrogen in the form of sulphate of ammonia at the rate of 3 to 7 lb. per tree. This orchard has previously received practically nothing in the way of fertilizers or manures. In another orchard in the western Transvaal, receiving exactly the same treatments slight but definite *decreases* in yield resulted from the same applications of ammonium sulphate—the heaviest applications causing the greatest falling off in yields. This orchard had previously received about 150 lb. kraal manure per tree annually for several years, though no artificial fertilizers.

Still a third orchard on the rich alluvial soils of the eastern Cape Province which received no fertilizers or manure in the past, showed no response to the identical fertilizer treatments one way or the other.

Analysis of Citrus leaves The above results may seem rather confusing at first sight, yet when analyses of leaves from these orchards were made, the whole position became clear.

In the case of the first orchard, which showed the greatest response the amount of nitrogen in the leaves was originally very low. Where ammonium sulphate was given, the nitrogen content of the leaves was raised and at the same time increases in yield invariably followed. In no case was the nitrogen content of the leaves raised to what could be called an abnormally high figure, and in all cases the more nitrogen given as ammonium sulphate, the more the yields were raised.

In the case of the second orchard (in the western Transvaal) the leaves were already very high in nitrogen when the experiment was started due to the effect of the nitrogen previously given in the kraal manure. Here the applications of ammonium sulphate raised this content even higher still and the more of this fertilizer given, the more the yields *decreased*. From this it was judged that nitrogen was not lacking in this orchard, and that by giving more than was actually required, the tree was so to speak, nitrogen poisoned, and yields fell off in consequence.

In the third orchard (in the eastern Cape Province) the leaves were about normal in nitrogen content at the start, and even after several years of fertilizing only slight increases could be brought about by giving ammonium sulphate. In this orchard no provable differences in yield were found between any of the different treatments. This again fits into the picture, and suggests that the way in which a tree is likely to respond to nitrogen fertilzers can be predicted if we know whether its leaves are low, normal, or high in nitrogen to start off with. If the content is low, the crop will probably be increased; if normal—probably not, though harmful effects will not necessarily follow; if already high, no good can be done, nitrogen fertilizers will be wasted, and an actual falling-off yields is quite possible.

The amounts of the other most important plantfoods, namely phosphorus, calcium, potassium, magnesium and sulphur present in Valencia leaves have been investigated in a similar manner, and both the normal content of leaves and the levels at which deficiencies are likely to occur for each of these has been determined.

A practical example An interesting case of the practical application of leaf-analysis may be mentioned here in connection with the eastern Transvaal orchard already referred to. Here soil analyses showed that the soil was very acid, and low in both calcium (or lime) and magnesium. The normal recommendation here would be to give lime, or perhaps dolomite, which contains both lime and magnesium. An analysis of the citrus leaves, however, showed that they were very high in lime and very low in magnesium. Applications of magnesite (which contains magnesium, but no lime) were therefore given to two out of the four trees in each experimental plot. After two years it now appears that this treatment is having beneficial results, since in eleven out of sixteen cases the magnesite treated trees are now outyielding the trees which did not receive it. Had lime alone been given the uptake of calcium, already high, would have been raised still higher and the shortage of magnesium would probably have been aggravated, with probable harm to the tree.

Method of taking samples Many hundreds of analyses of leaves made by the writer during different times of the year, and of samples taken in various ways have shown quite clearly that the amounts of each of the different plant-foods vary greatly from leaf to leaf in any particular tree, chiefly according to the age of the leaf on the tree. This makes it quite clear that for leaf analyses to be of any value a definite method of taking samples must be followed, and leaves must only be picked from a certain stage of growth and at a certain time of the year. This sampling method is simple and may be summarised as follows:-

Leaves are taken from the stalk of the fruit, directly up against the fruit during the period June to July. Since the date of the Spring flush when the fruits and leaves were first formed, can easily be found out, the exact age of these leaves can also be found—namely, ten to eleven months old. All samples, picked in any part of the country, will be of approximately the same age, and are thus comparable. No great skill is needed in selecting a good sample of leaves, which can easily be picked by any interested grower.

An invitation to growers The work outlined above has now reached a stage where it seems desirable to test out conclusions more extensively. To this end, the Division of Horticulture wishes to get into touch with interested growers in all parts of the country with a view to diagnosing the fertilizer needs of their orchards by leaf analysis methods, and following up the responses caused by the fertilizers applied.

The fertilizer position in the Union at the moment is such that every effort must be made by all growers to apply only those fertilizers actually essential for maintaining or raising production.

In very many cases fertilizer mixtures are quite unnecessary for citrus trees, and growers could economize by changing over to single fertilizer alone. In other cases it is quite possible that the amounts of fertilizer given are excessive, and could be cut down quite safely without causing a drop in yields. Growers would not only help themselves by such economies, but would leave more fertilizers to those farmers who might otherwise be forced to do without them.

Any growers interested in this subject, and wishing the Department to report on the probable fertilizer requirements of their orchards as indicated from leaf analyses are cordially invited to communicate with the Chief, Division of Horticulture, P. O. Box 994, Pretoria. No charge will be made for this service, and the grower will be under no obligation to carry out suggestions which may be made. *Farming in S. Africa, Vol. 18, No. 206, May 1943.*

Intensified Potato Culture in the U. S. S. R.

By H. V. GARNER, M. A., B. Sc.,

Rothamsted Experimental Station, Harpenden, Herts

At the outbreak of war the Russian Agricultural Research Stations devoted themselves to the problem of maximum production of food and raw materials in the U. S. S. R. The potato, yielding as it does the highest amount of human food per acre of any crop in common cultivation, naturally figured prominently in the plan. The necessary large increase in potato acreage raised several serious problems in regard to the supply of seed tubers, and the way in which these difficulties are being met is an interesting example of the work of Russian scientists during the war.

Tips as Seed The first problem was to reduce the tonnage of potatoes taken for seed to an absolute minimum. Something much more drastic than the usual cutting of large potatoes into two sets was required. The solution came from Professor Lysenko and his colleagues at the Lenin Agricultural Science Academy who developed a method of saving for seed the tips of potatoes that were to be used for domestic or industrial purposes. The procedure was to cut off quite a small portion of the rose end of the tuber with the buds attached and collect and store the tips in such a way that their vitality was preserved until planting time. The remainder of the tuber was used as food. The weight of the tip being only about ½ oz., the quantity of food material used for seed could therefore be reduced to about one-quarter of the normal when this procedure was adopted. By organization, demonstrations and the issue of working instructions, some 380,000 acres were planted with tips in 1942, representing a saving of thousands of tons of seed.

Comparisons of the produce of tips with that for whole seed under field conditions showed that the yield from the tips was much the same as that produced by ordinary seed potatoes. The idea has been carried still further by Professor Yakushkin of the Timizyazev Agricultural Academy, Moscow. He proposes a method of "tuberless" sowing of potatoes. The eyes are cut in spring and planted in boxes or forcing houses, and in May the young plants are put out in the open. At least three-quarters of the original tuber is saved for food by this method and it is claimed that the plants grown from eyes are 15—20 days earlier than those from ordinary seed tubers (in 1942 at any rate), and that they yielded quite as well.

Two crops in one season Other physiological studies on potato seed have been directed towards controlling the period of dormancy of tubers. In certain parts of the U. S. S. R. it would be quite practicable to secure two crops of potatoes in a single season if seed dug in early summer could be planted the same

year. Normally this is not possible because such seed would not germinate. It has been found that the length of rest period in potatoes depends on external conditions and particularly on the supply of oxygen to the inside of the tuber. The skin of new potatoes prevents the penetration of oxygen. If the skins are removed and prevented from reforming, the tubers will germinate in 7—10 days. Methods for carrying out these requirements in practice have been worked out and successfully tested on collective farms in the irrigated areas of Central Asia. The results of this work will increase the potato area in southern regions in 1943.

The practices outlined above clearly demand an appreciable amount of detailed organization, extra care, and trouble. In normal times they would probably be discountenanced as tending to deterioration of stocks but their value in a state of emergency is undoubted and reflects the energy with which every avenue of production is being explored in the U. S. S. R. *J. Min. Agri.* 50 (1943): 20—21.

Abstracts

Production Recording Scheme (*Food per Acre* by R. H. Smith. *J. Min. Agri. London Vol. 49, No. 4, March 1943.*) So far, judging farm management efficiency has been difficult, with the basis of money returns, per acre or per unit of labour, as the criterion. This has been complicated by the diversity in the types of soil and farming.

The plan A new plan conceived by Captain L. R. Bomford, of Tufton Warren solves the problem in an ingenious and simple manner. It is characterised by (1) simplicity in keeping records, (2) simplicity of results obtained after the results are collated, and (3) results lending themselves for comparison of even different types of farming. Records were maintained according to the new plan for 28 farms in Whitchurch district for 1941-42. A monthly return of all sales and purchases of produce, livestock and feeding stuffs was prescribed,—corn and milk by measure, potatoes, feeding stuffs etc., by weight, and eggs and livestock by number. The information so obtained was summarised for the year, the June return giving the opening and closing stock.

Assessing results The commodity sold off the farm is translated into the acres, that should have been adequate, by dividing the actual sales by the standard yield of the district that is fixed. In the case of animal produce, the output per animal and the acreage that will maintain the animal furnishes the standard for the animal produce. Thus the year's output is converted into the number of acres from which it should have been obtained. From this is deduced the number of acres that should have produced the feeding stuffs received during the year. This net acreage is represented as a percentage of the farm area and is a measure of the efficiency of management. The result depends on the yield of crops, the effective utilisation of produce by livestock, the efficient use of machinery, labour etc., and efficient marketing. The efficiency percentage is a true index of the farmer's ability to manage farms in any locality and farms are comparable irrespective of the type of farming, provided the soil conditions do not vary widely. Where soil conditions are divergent, different standard yields may have to be assumed.

Weakness revealed The variation in efficiency of the 28 farms in Whitchurch varied from 31 to 106%, with the majority lying between 50 and 70%. The efficiency was not correlated either to the size of the farm or the type of farming. The low level of the results was not expected by the farmers concerned. The low level indicates that all the several departments of the farm do not give a uniform and high output as is presumed by the complacent. The low and high outputs in the different sections tend to counter-balance each other and

100 % efficiency is possible only where efficiency is maintained in each and every section.

With the data and information recorded it was not possible to locate the weak links in the system without details of the farm-grown grains and feed used for feeding the different classes of livestock. The production figures give indications of low efficiency, where they exist, and a diligent search will furnish the answer. Farm efficiency could be built up by suitably changing the farm policy and management.

Value of production recording The scheme:

1. Is simple and readily understood by farmers and does not involve the maintenance of special detailed records.
2. Requires all round efficiency to obtain 100 % efficiency.
3. Enables comparison of neighbouring farms, irrespective of the type of farming adopted.
4. Shows the suitability or otherwise of the farm policy.
5. Is a true index of the farmer's efficiency and management.

The advantages of the system and the many interesting and valuable facts obtained from a very meagre amount of information far outweigh any disadvantage, that is inherent.

V. T. S.

Formation of nicotine in plants grafted on tobacco A Shmuck, A. Smirnov, and G. Ilyin *(Compt. Rend. (Dok.) Acad. Sci. U. R. S. S , n. ser., 32 (1941), No. 5 pp. 365–368)* When scions of *Solanum nigrum*, tomato, and *Datura stramonium*, none of which normally synthesize nicotine, were grafted on to tobacco stocks, all three species were found to elaborate nicotine. Conversely, when tobacco scions were grafted on to stocks of these three species, the tobacco itself lost its power to synthesize the alkaloid. It thus seems obvious that formation of nicotine by tobacco is connected in some obscure way with the root system and stem of the plant. Tobacco grafted into *Nicotiana glauca* also lost its ability to elaborate nicotine, forming anabasine instead, but when *N. glauca* was grown on a tomato stock it produced as much anabasine as control plants on their own roots. The significance of these findings are briefly discussed. *Exp. Sta, Rec. Vol. 88 pp. 174–175, February 1943.*

New Cambridge breeds of poultry by M. S. Pease, M. A., School of Agriculture, Cambridge, *J. Min. Agri. (1943) 50 43–44.* The new Cambridge breeds of Poultry are new auto sexing varieties of poultry which breed true and show sex distinction in the tint and markings of the chick-downs at hatching. This difference is clear at a glance and perpetuates itself unchanged from generation to generation. There are several varieties.

Cambar has been bred from Barred Rock crossed by Campine and graded up to Canadian and American utility Barred Rocks. It is medium sized, close feathered, hardy, non-broody, utility type and has given very good egg production. The tint of the egg is variable. The sex distinction in the downs is particularly sharp and reliable. The breed has been made in both silver and Gold variants.

Legbar has been developed from the Brown leghorn. It has the merit of high egg production but there is a tendency to develop small body size and produce small eggs. Pure females can be mass-produced by putting a Legbar male to ordinary brown leghorn females.

Dorbar is based on the Silver Grey Dorking but is an active utility egg producer. Eggs are pure white and large. Sex distinction in the downs is sharp and constant. The breed has been made in both Silver and Gold.

Buffbar is the barred variety of the Buff Orpington. It is excellent in winter egg production but there is a tendency to broodiness in summer. The female buffbar can be bred from mating the Buffbar male back to the basic Buff Orpington breed as in the legbar. The sex distinction in the downs, is one of tint only; the deep gold or salmon buff downs being the females and the pale downs the males. The distinction is not so sharp as in the other breeds.

The new Cambridge breeds open up two new extensions of sex linked crossing. Firstly when crossed amongst themselves *in either direction and in almost any combination*, the chicks still retain the sex distinction in the down at hatching. Secondly, if a male gold Cambar, Dorbar, or Legbar is put to ordinary silver females (say, Light Sussex) sex linked cross bred pullets are obtained which can themselves be used for further sex linked crossing; the pullets from this cross can similarly be used and so on indefinitely. This method of repeated sex linked crossing has many advantages. T. N.

Gleanings

Snake-bite cures I have tried Some years ago I had read with a smile of incredulity, in the "Tropical Agriculturist" writes Mr. Donald Obeyesekere in the *Ceylon Observer*, that in Burma the remedy commonly used by the people of that country for snake bite was the juice squeezed out of the lower portion of the trunk of the Ash-plantain tree.

Months later, a bull-terrier dog of mine was badly bitten by a cobra which he had seized and when he was about to die, what I had read in the "Tropical Agriculturist" flashed across my mind and I got a plantain rooted up and had the root end of its trunk pounded in a mortar and the juice squeezed out of it and administered a breakfast cupful of it by slow degrees to the animal, with the result that a complete recovery was effected much to the amazement of everyone in my house.

Since then I have always resorted to that remedy using any variety of plantain tree whenever my dogs get bitten by snakes, and have found it a sure and certain cure. I have recently come into possession of an ancient *ola* Sinhalese manuscript dealing with snake-bites and the cures for them and it may interest the public to know a few of the numerous prescriptions contained in it.

For Cobra Bite: 1. Make a mellun (dry curry) of the root end of the Ash-plantain (Musa-paradisiaca) tree, add a little salt to it and tie it over the wound.

2. Take the leaves of the Hathavaria (Asparagusraemosus) and Kirianguna (Dregea volubilis) and grind them with human urine and apply a plaster of it to the wound.

For Polonga (Viper Russeli) Bite: 1. Wipe the wound with the leaves of Volpenela (Cardiospermum helicacabum).

2. Take the leaves, root and bark of the Kaduru tree (Strychnos-nuxvomica), pound them adding a little salt and turmeric, make a mellun (curry) of it and tie it over the wound.

3. Take the leaves and bark of the Kambaranga tree, add turmeric and salt, make a mellun (curry) of it and tie it over the wound. (*The Hindu, July 17, 1943*).

Sugar as a food In Australia, too, the institution of sugar rationing has let loose a number of statements by so-called experts depreciating the value of sugar as a food and suggesting that such rationing is likely to improve the health of the community. Actually, as the Australian Sugar Producers Association point out, the people of Australia and New Zealand, who have for some time eaten something like 4½ ounces per day, are as is well known, among the healthiest and most vigorous people in the world. We are reminded from the same

source that Sir James Crighton Browne, a noted authority on diet, has expressed a conviction that races of mankind which consume but little sugar show a physical condition decidedly inferior to that possessed by those who are large consumers. The American Army finds that 5 ounces per day is a desirable ration for the fighting men, and sees that they get it. (*International Sugar J. May 1943.*)

Insecticidal Aerosols An aerosol is a kind of mist in which a liquid or solid in colloidal dispersion is suspended in a gas. Insecticidal aerosols have been found to be highly toxic to many species of insects. Heretofore their preparation has been found to be a difficult matter; but now it has been found that they are formed when a solution in some low boiling solvent is allowed to escape under its own pressure through a fine nozzle. An aerosol well adapted for the control of flies and mosquitoes in the presence of man is prepared by spraying a solution of purified pyrethrum extract and sesame oil in dichlorodifluoromethane. This preparation is non-toxic to man, non-inflammable, and does not produce oily deposits. It is now being manufactured commercially, and dispensed in 1 lb. packages, but for the time being the entire output in the U. S. is being used by the allied armed forces. (*The International Sugar J., April 1943.*)

Copper dusted wheat as a supplementary feed for sheep Farmers who have on hand quantities of wheat treated with proprietary copper dusts for the prevention of bunt, have approached the Department for advice as to whether this treatment of the wheat makes the grain dangerous as food for sheep. A small feeding trial was recently conducted at Glenfield in order to determine this point. It was found that no serious ill effects resulted, and that the grain was just as nutritious as untreated wheat. (*Agri. Gaz. N. S. W. June 1943.*)

Research Items

CLIMBER CHILLY

In one of the agricultural tours, I came across climbing types of perennial chillies in the country side in Mysore State bordering Hindupur Taluk. These plants were clinging on to Areca palms, in a climber fashion. Plants 4½ years old were 15 to 20 feet high. Half a dozen plants put in originally have been supplying the gardener with green and ripe chillies in quantities sufficient for his family consisting of 12 members. Two types were noted, one with fruits ¾ to 1 in. and the other with fruits 1¼ to 1½ in. long. Both the forms are very pungent and are required to be used in quantities less than the ordinary chillies.

Seedlings are raised in nurseries and 6 weeks old plants are set out in their permanent places in pits 2 ft. × 2 ft. × 2 ft. filled with a mixture of well-rotted cattle manure and rich soil. The plants begin to bear from the 4th month onwards continuously, without a break. The plants have to be manured every year.

It is suggested that the climber chilly can be planted in place of the ornamental bower plants in gardens and parks, in odd corners about the residential buildings and in arecanut, betel vine and coconut gardens, in fact in any piece of irrigated land and even in shady places. This in turn will release a certain area from the cultivation of the ordinary bush type chillies grown in the field and which could be devoted to food crops. The ordinary chilly occupies 3 lakhs of acres in the Madras Presidency and what an extent of land can be released when the planting of the climber chilly is taken up in earnest in all possible places.

Freedom from attack of thrips is another major point in favour of the climber. Thrips have not been noted in the gardens that are having the climber now for a period of about 5 years. Chilly is a costly crop to grow and the annual loss caused by thrips is something enormous, in the aggregate. Possibly

the climber could be used for crossing work, for evolving thrips-resistant varieties.

The perennial habit of the climber is another desirable character under certain conditions.

Seeds can be made available by the author in small quantities, for people who want to grow the crop for seed multiplication. Arrangements are being made for the identification of the plant and it will be notified in these columns in due course.

Hindupur,
August-19, 1943.

K. V. Seshagiri Rao,
Asst. Agricultural Demonstrator.

Hints for Bee-keepers

For October 1943

Bee-activity for this month is more or less governed by seasonal factors. The weather is generally calm, and if the usual rains are received by the end of September, the condition of the vegetation improves and bees readily respond to these favourable environments. The chief pollen yielding flora for the month are castor, sun-flower, *cholam*, maize, *cumbu*, *Peltophorum ferrugineum*, *Ailanthus excelsa*, *Holoptelia integrifolia* and *Commelina forskalaei*. The nectar supply is comparatively poor, the main sources being *bhendi*, gingelly, soapnut, *Chionachne koenigii* and a few cucurbitaceous plants. If weather and pasturage conditions are favourable, there will be active field work and brisk breeding with consequent improvement in the condition of the colonies. As a large field force of bees is necessary for honey collection, steps should be taken to build up the strength of the colonies from the very advent of the breeding season. The following few manipulations, if given at the right time, would go a long way to achieve this object. The improvement in the condition of the hive is first indicated by the increased rate of oviposition in the central combs. The area for egglaying can be augmented by placing a clean comb, or a frame with a piece of comb foundation sheet. If these are not available, the side combs, which are generally stocked with food material, may be transferred to the centre after the brood cells in the central comb are sealed. If there are a few strong colonies, one or two combs with brood may be taken and given to the weaker colonies. Deficiency in the nectar supply can be made up by artificial feeding. If on the other hand the rains fail and pasturage is meagre the condition of the colonies deteriorates and the colonies have to be tended with great care to prevent their desertion.

M. C. Cherian and S. Ramachandran

Crop and Trade Reports

Cotton—First Report—1943-44 The average area under cotton in the Madras Province during the five years ending 1941-42 represents 9·8 per cent of the total area under cotton in India.

The area under cotton in the Madras Province up to 25th July 1943, is estimated at 230,000 acres. When compared with the area of 240,600 acres estimated for the corresponding period of last year, it reveals a decrease of 4·4 per cent.

Central districts and the South—mainly Cambodia tract. The area in the Central districts and the South represents generally the last year's crop left on the ground for second pickings before the plants are removed in September in compliance with the provisions of the Pest Act. The area in these districts is estimated to have fallen from 165,900 acres to 139,900 acres, the fall in acreage being confined to Salem, Coimbatore, Trichinopoly and Madura. The yield is expected to be generally normal.

Westerns tract The area under Westerns is estimated to have risen from 59,700 acres to 68,400 acres. The increase in area in the current year is due mainly to the good rains received in May 1943.

White and Red Northerns tract The area under White and Red Northerns is estimated to have risen from 5,500 acres to 7,000 acres.

Warangal and Cocanadas tract The area under Warangal and Cocanadas cotton is estimated to have risen from 3,500 acres to 10,500 acres, i. e., by 200 per cent.

The average wholesale price of cotton lint per imperial maund of $82\frac{2}{7}$ lb. or 3,200 tolas as reported from important markets on 31st July 1943 was Rs. 41-2-0 for Cocanadas, Rs. 41-2-0 for White Northerns, Rs. 34-9-0 for Red Northerns, Rs. 40-15-0 for Westerns (Mungari crop), Rs. 45-1-0 for Westerns (Hingari crop), Rs. 72-4-0 for Coimbatore Cambodia, Rs. 57-2-0 for Virudhunagar (Southern) Cambodia, Rs. 63-2-0 for Coimbatore Karunganni, Rs. 52-9-0 for Tinnevellies and Rs. 38-14-0 for Nadam cotton. *(From the Commissioner of Civil Supplies.)*

Cotton—Intermediate—report 1943-44 *Last year's crop:* The yield of the second or summer pickings of the 1942-43 crop is estimated to be generally normal.

Current year's crop: The main season for sowing is not yet over in most parts of the Province. Sowings of the crop are in progress in parts of the districts of Kistna, Kurnool, South Aroct, North Arcot, and Coimbatore. The condition of the early sown crop is reported to be generally satisfactory except in parts of the Deccan where the crop had a set back due to drought in August.

The average wholesale price of cotton lint per imperial maund of $82\frac{2}{7}$ lbs (or 3.200 tolas) as reported from important markets on 4th September 1943 was Rs. 37—1—0 for Cocanadas, Rs. 34—13—0 for White Northerns, Rs. 34—9—0 for Red Northerns, Rs. 31—15—0 for Westerns (Mungari), Rs. 29—2—0 for Westerns (Hingari), Rs. 73—11—0 for Tirupur Cambodia, Rs. 59—14—0 for Coimbatore Karunganni, Rs. 51—11—0 for Virudhunagar Cambodia, Rs. 47—9—0 for Tinnevellies and Rs. 37—4—0 for Nadam cotton. When compared with the prices published in the last report, i. e., those which prevailed on 31st July 1943, these prices reveal a fall of 35 per cent in the case of Westerns (Hingari), 22 per cent in the case of Westerns (Mungari crop), 15 per cent in the case of White Northerns, 10 per cent in the case of Cocanadas, Virudhunagar Cambodia and Tinnevellies, 5 per cent in the case of Coimbatore Karunganni, and 4 per cent in the case of Nadam cotton and a rise of 2 per cent in the case of Tirupur Cambodia, the price remaining stationary in the case of Red Northerns. *(From the Commissioner of Civil Supplies.)*

Statistics—Groundnut—Second report—1943 *Summer crop—Area and yield* The area under the summer crop of groundnut in parts of the Madras Province during the five months—January to May 1943—is estimated at 86,300 acres as against 39,700 acres estimated for the corresponding period of last year, representing an increase of 117·4 per cent. The large increase in area is due partly to the prevalence of attractive prices for groundnut and partly to its being sown in certain areas where the supply of water in irrigation sources was not sufficient for raising second crop paddy. The harvest of the crop is in progress. The yield per acre is expected to be normal in all districts except Chingleput and South Arcot where the crop is reported to have been damaged by heavy rains in May '43 and Ramnad where the crop was damaged by insect pests to some extent. The total yield is estimated at 72,300 tons of unshelled nuts as against 35,100 tons estimated for the corresponding period of last year, representing an increase of 106·0 per cent.

Early crop—Area and yield: The area under the early crop of groundnut (mostly unirrigated) up to 25th July 1943 in the districts of Salem and Coimbatore

is estimated at 143.500 acres. When compared with the area of 141,000 acres estimated for the corresponding period of last year, it reveals an increase of 1·6 per cent. The yield per acre is expected to be normal in both the districts. The yield in these two districts is estimated at 71,600 tons of unshelled nuts as against 70,500 tons estimated for the corresponding period of last year, representing the same increase as in the case of acreage namely 1·8 per cent.

The wholesale price of groundnut (machine shelled) per imperial maund of 82$\frac{6}{7}$ lb. (equivalent to 3,200 tolas) as reported from important market centres on 7th August 1943 was Rs. 13—3—9 in Erode, Rs. 13—1—0 in Vizianagaram, Rs. 13/– in Guntakal, Rs. 12—14—0 in Cuddapah, Rs. 12—11—0 in Vizagapatam, Rs. 12-0-0 in Guntur, Bellary, Cuddalore and Vellore, Rs. 12—6—0 in Nandyal, Adoni and Salem, Rs. 12—1—0 in Hindupur. When compared with the prices published in last report, i. e., those which prevailed on 10th April 1943, these prices reveal a rice of approximately 27 per cent in Guntakal, 18 per cent in Bellary, 8 per cent in Vizianagaram, 6 per cent in Salem, 5 per cent in Vizagapatam, 4 per cent in Cuddalore, 2 per cent in Guntur, Cuddapah and Erode and a fall of approximately 4 per cent in Nandyal and 2 per cent in Adoni and Vellore, the price remaining stationary in Hindupur. (*From the Commissioner of Civil Supplies.*)

Sugarcane—Intermediate—or condition report 1943 The condition of the sugarcane crop is reported to be generally satisfactory in all the districts of the Province. The recent rains are expected to benefit the crop in the Deccan. The yield per acre is expected to be normal if the season continues to be favourable.

The average wholesale price of jaggery per imperial maund of 82$\frac{6}{7}$ lb (or 3,200 tolas) as reported from important markets on 4th September 1943 was Rs. 15—13—0 in Erode, Rs. 14—2—0 in Salem, Rs. 12—8—0 in Mangalore, Rs. 11—9—0 in Cuddalore, Rs. 11—8—0 in Rajahmundry, Rs. 11—7—0 in Trichinopoly, Rs. 11—2—0 in Bellary, Rs. 11—1—0 in Coimbatore, Rs. 10—5—0 in Chittoor and Vellore, Rs. 10—1—0 in Vizianagaram and Adoni and Rs. 9—4—0 in Cocanada. When compared with the prices published in the last report i. e., those which prevailed on 7th August 1943, these prices reveal a fall of about 24 per cent in Cocanada, 14 per cent in Chittoor, 10 per cent in Cuddalore and Mangalore, 7 per cent in Bellary and 3 per cent in Trichinopoly and a rise of seven per cent in Coimbatore, the prices remaining stationary at Vizianagaram, Rajahmundry, Adoni, Vellore, Salem and Erode. (*From the Commissioner of Civil Supplies.*)

Pepper—First Forecast Report, 1943 The area under pepper up to the 25th August 1943 in the districts of Malabar and South Kanara is estimated at 102,500 acres (94,000 acres in Malabar and 8,500 acres in South Kanara) as against 104,500 acres (95,800 acres in Malabar and 8,700 acres in South Kanara.) estimated for the corresponding period of the previous year. The yield per acre is expected to be normal.

The wholesale price of pepper per imperial maund of 82$\frac{6}{7}$ lb. (equivalent to 3,200 tolas) as reported from important market centres on the 4th September 1943 was Rs. 50—3—0 at Calicut, Rs. 48—10—0 at Tellicherry and Rs. 54—6—0 at Mangalore. When compared with the prices that prevailed at the time of issue of the final forecast for 1942-43 i. e. on the 11th January 1943 these prices reveal a rise of approximately 64 per cent at Mangalore, 68 per cent at Calicut and 76 per cent at Tellicherry. (*From the Commissioner of Civil Snpplies.*)

Ginger—1943—First forecast report The area uuder ginger up to 25th August 1943 is estimated at 12,600 acres in Malabar and at 600 acres in South Kanara as against 11,600 acres in Malabar and 350 acres in South Kanara estimated for the corresponding period of the previous year. The condition of the crop is satisfactory and the yield per acre is expected to be normal. (*From the Commissioner of Civil Supplies.*)

Cotton Raw, in the Madras Presidency The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February to 20th August 1943 amounted to 295,167 bales of 400 lb. lint as against an estimate of 406,300 bales of the total crop of 1942-43. The receipts in the corresponding period of the previous year were 509,009 bales. 424,799 bales mainly of pressed cotton were received at spinning mills and 839 bales were exported by sea while 163,227 bales were imported by sea mainly from Karachi and Bombay. (*From the Director of Agriculture, Madras.*)

Moffussil News and Notes

Srivilliputhur A small agricultural Exhibition was held at Srivilliputhur during the Andal festival from 28--7--43 to 3--8--43 in the vicinity of the temple. All the wall posters were very prominent, attractive and highly educative. The implements for the tract, specimens of seeds and manures and specimens of fungus diseases and insect pests were exhibited in the stall in separate compartments. A few fruits of Sathugudi oranges grown in Rajapalayam were also put on show. Preparation of *cholam* malt was practically demonstrated. Above all the Rathna Sing's hand paddy-sheller drew the attention of the visitors. The simplicity in construction and design with its high efficiency were very much appreciated.

With intermittent lectures to groups of *ryots* and other visitors, leaflets were freely distributed and advice on various agricultural improvements and 'grow more food' and vegetable cultivation in particular was given. (N. S.)

War Services Exhibition, Madras As a wing of the War Services Exhibition at Madras from the 1st to the 14th September 1943, an agricultural stall was put up in a scale not attempted so far. The special feature of the exhibition was a field scale show of field, fodder and green manure crops, and fruit plants representative of the presidency, and a vegetable ornamental park to demonstrate how in war time the flowers and Crotons in the ornamental home park and garden could give place to vegetables in an useful way. The various sections of the Coimbatore Agricultural Research Institute were represented. Practical demonstrations were arranged of the use of the wooden hand huller for hulling rice, the use of inedible oils for lamps, dehydration of vegetables, the preparation of "Yeast-food" using molasses, edible mushroom culture, bee-keeping, malt-making, and biscuits and cake-making using *cumbu, ragi* and banana flour. Aeroplane and gun models decorated with fruits to represent the slogan "Fruits for home defence", attracted considerable attention. Flags were hoisted to decorate the premises and carried instructive captions: "Grow More Food," "Eat More Millets", "Use Hand-pounded Rice" etc. The exhibition was highly educative and much appreciated by the visitors. His Excellency the Governor of Madras, several distinguished persons and officers of high rank, both civil and military, visited the stall. It was estimated that 20 lakhs of people visited the exhibition.

College and Estate News

Students' Corner *Students' Club* An interesting debate was held on 23—8—43. with Sri P. V. Rajagopalan in the chair, the proposition being 'in the opinion of the house absentee landlordism is a menace to Agriculture' Sri K. Appalanarasayya of class III opened the debate, and the opposition was led by Sri V. T. Subbiah Mudaliar. Several students and a few members of the teaching staff took part. The proposition was carried by a majority. Mr. R. C. Broadfoot, ex-principal was the observer and he gave his views on the proposition for the benefit of the students.

Games *Cricket* The Victory cup matches began on 21st August when the 1st year class was pitched against class III. The latter won with 77 runs (V. Pai 21, Priyavratha Rao 17) to 33. (P. Pai 5 for 19). On 22nd August, the second year class played against class III and won over with 65 runs (Krishnan 22, Madhava Rao 22) to 47 (Krishnan 7 for 21).

In a friendly match with C. C. E. the College won by 2 wickets and 12 runs (Alwa 38, Muthukumarappa 21 and Madhava Rao 20).

Hockey In a series of matches played against Navy A., Stanes European High School, A. R. P., and Sporting Union teams, our College team was successful in all.

Foot Ball The only match played with the Navy team ended in a draw.

College The first terminal examinations for all the classes commenced with practicals in the first week and ended with theory from 14th to 16th. The College closed for the Michaelmas vacation on the 17th and most of the students have left for their homes.

Madras Agricultural Students' Union At a meeting of the Editorial Board of the Union held on 23rd August, Sri M. A. Sankara Ayyar was elected as a member of the Board in the vacancy caused by the transfer of Rao Bahadur V. Ramanatha Ayyar to Madras. He was also elected as the sub-editor.

A. R. P. An A. R. P. practice was held on 13—9—43, in which a batch of Wardens were given training in message writing, marshalling of vehicles etc.

Officers' Club An oil painting portrait of Sri K. Krishnamurthi Rao, retired Assistant Sugarcane Expert, presented by some of his friends to the Agricultural College Officers' Club was unveiled by Sri V. T. Subbiah Mudaliar, the president, on 4th September 1943. Sri K. Krishnamurthi Rao was himself present on the occasion.

Departmental Notifications

Gazetted Service—Appointments

Sri V. Thirumala Rao, Assistant in Entomology, to act temporarily as Assistant Entomologist, in connection with the scheme for the breeding and liberating of the predator Lady Bird.

Sri K. Gurumurthi, Agricultural Demonstrator, to act temporarily as District Agricultural Officer for the scheme of supply of fresh fruits and onions to the troops in Vizagapatam area.

Postings

Sri M. Suryanarayana on return from leave to resume his post of Assistant Agricultural Chemist, Coimbatore.

Sri K. Venkatarama Ayyar, on return from leave to be D. A. O. Ellore.

Subordinate Service—Appointments

Sri V. Satagopa Ayyangar, A. D. deputed for a period of one month to investigate the scope for increased cultivation of food crops on temple and mutt lands in the Tanjore District.

The following officers are appointed as Food Inspectors:

Sri M. Venkataramayya, A. D. Gudur to Nellore.
" T. Paramanandam, A. D. Narasaraopet to Guntur.
" S. Sithapathi Rao, A. D. Amalapuram to Cocanada.
" P. Lakshminarayana, F. M. Samalkota to Bheemavaram.
" T. Lakshmipathi Rao, A. D. Tadepalligudem to Tadepalligudem.

Sri C. S. Krishnamurthi, Fieldman, Central Farm, Coimbatore to be Asst. in Mycology.

Sri K. Raja Rao, upper subordinate to be Asst. in Cotton, A. R. S. Nandyal.

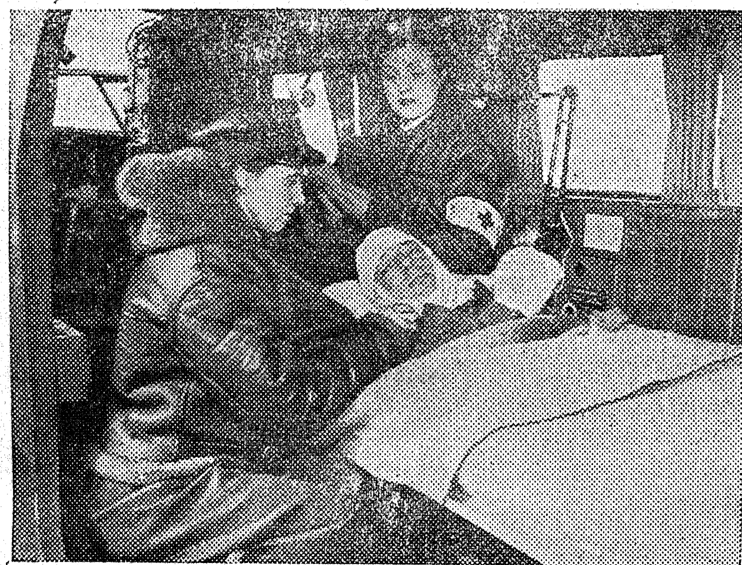
Transfers and Postings

Name of officers	From	To
Sri M. V. Narasimha Sastry	A. D. Chodavaram	F. M. A. R. S. Guntur
,, A. Subba Raju	F. M. A. R. S. Guntur	Asst. in Cotton Mungari Scheme
Janab M. Fassuddin Sahib	Asst. in Cotton Mungari Scheme, Adoni	A. D. Kistna Dt.
Sri D. Bapayya	F. M. A. R. S. Guntur	A. D. Kurnool Dt.
,, G. Rama Rao	Asst. in Fruit Section, Koduru	F. M. A. R. S. Anakapalle
,, A. Sankaram	F. M. A. R. S. Anakapalle	Asst. in Chemistry, Coimbatore
,, S. Suryanarayana	A. D. Vizagapatam	A. D. on special duty for cultivation of fresh fruits and onions, Vizagapatam
,, H. Narasimhamurthi	Fieldman, A. R. S. Hagari	Asst. in Cotton, A. R. S. Hagari
,, K. Satyanarayanamurthi	Asst. in Cotton, Adoni	Asst. in Cotton, Hagari
,, D. Narayana Rao	Asst. in Cotton, Nandyal	Asst. in Fruits, F. R. S. Kodur
,, M. L. Narayana Reddi	A. D. Anakapalle	A. D. Chipurupalli
,, K. Suryanarayana	A. D. Chipurupalli	A. D. Salur
,, P. Y. Chintamani	A. D. under training Bobbili	A. D. Anakapalle
,, M. Vaidyanathan	A. D. Wheat Rust Control Scheme, Ootacamund	A. D. Coonoor
,, P. A. Venkateswara Ayyar	A. D. (on leave)	A. D. Rasipuram
,, V. M. Ramunni Kidavu	A. D. (on leave)	A. D. Omalur
Janab P. M. Sayeed Sahib	Asst. in the Coconut Scheme, Kasaragod	Asst. in the Coconut Scheme, A. R. S. Nileshwar
Sri S. D. S. Albuquerque	Asst. Coconut Scheme, Nileshwar	Asst. in Oil Seeds Section, Coimbatore
,, C. T. Ittyachan	Asst. in the Coconut Scheme, Coimbatore	Asst. in the Groundnut Scheme
,, M. V. Narasimha Sastry	A. D. Chodavaram	F. M. A. R. S. Guntur
,, V. Achutharamayya	D. A. O. Ellore	F. M. A. R. S. Samalkota

Leave

Name of officers	Period of leave
Sri N. Krishna Menon, Sub Asst. Entomology	Extension of l. a. p. for 2 months from 5—9—43
,, P. Somayajulu, A. D. Ramachandrapuram	L. a. p. for 30 days from 1—9—43.
,, G. Kameswara Rao, A. D. Dhone	Earned leave for 30 days from 14-3-43
,, S. V. Naidu, A. D. Markapur	Extension of leave on half average pay on m. c. for 2 months from 2-8-43

„ S. Bhima Raju, A. D. Chandragiri	Extension of l. a. p. on m. c. for 3 months from 17—8—43
„ N. Krishna Pillai, A. D. Pollachi	L. a. p. for 2 months on m. c. from 10—8—43
„ C. Venkatachalam, A. D. (on leave)	Unearned leave on m. c. for 60 days from 28—7—43
„ M. K. Swaminathan, A. D. (on leave)	Extension of l. a. p. for 2 months on m. c. from 16—9—43
„ M. Damodara Prabhu, F. M. (on leave)	Extension of l. a. p. for 1 month from 28—9—43



TD. 5.

NURSING ORDERLIES OF THE BRITISH WOMENS AUXILIARY AIR FORCE

W. A. A. F. ambulance orderlies now fly in British ambulance 'planes, tending sick or wounded airmen and bringing them back from remote stations for hospital treatment. These women receive flying kit and flying pay. They have all volunteered for this special duty.

Picture shows: Two of Britain's W. A. A. F. nursing orderlies attending to an airman patient in an ambulance 'plane.

The Madras Agricultural Journal

(ORGAN OF THE M. A. S. UNION)

Vol. XXXI OCTOBER 1943 No. 10.

EDITORIAL

The Transport Problem Sir Kenneth Mitchell, Controller of Road Transport to the Government of India, in his presidential address to the Indian Road Congress held at Gwalior on 4th October 1943, has comprehensively reviewed the position of the roads and the various road problems in India and has made certain valuable suggestions for the improvement of the roads. The improvements that he envisages for the post-war period are ambitious, too ambitious in fact, and one wishes that it were possible to give effect to every one of them.

Everybody would agree with him when he says that the road-mileage in India is very meagre and that a large number of villages have not got even communicable roads connecting them with either district roads or highways. The extension of the road services to the villages would promote the material welfare of the country enormously. The inadequacy of the roads increases the transport charges unduly and handicaps the villager to a large extent in the efficient marketing of his produce. The villages not connected by proper roads are obliged to sell their grains at 4 to 12 annas less per bag than the roadside villages. The loss sustained by the cultivator in the villages not having road facilities can easily be imagined. It is enormous in the aggregate. The need for the provision of communicable roads requires no emphasis and the investment of money in village communications will be amply repaid in the increase of the welfare of the countryside. Such roads will also stimulate the production of commodities that enter a wider market.

Sir Kenneth has stated that motor transport has come to stay in India. Since pneumatic tyres and iron tyres (of the country cart) require different road surfaces, for full and efficient service, the suggestion is made to examine the possibilities of segregating the different classes of traffic on different roads, at least in places of heavy traffic and congestion. The implication is that at least in such places, two or more tracks will have to be laid side by side for the efficient movement of different classes of vehicles, in place of the single track that exists ; the duplication to be instead of the development and widening of the present roads to cope with the expanding traffic. It may be doubted whether laying such multiple tracks would ever be possible or feasible in the case of a poor and undeveloped country like India. We would rather suggest the extension of suitable

single-track roads to every village and their regular and proper maintenance, before laying multi-track roads is taken up for consideration. The country cart will remain the prime transport vehicle in India for a very long time to come and till then the road surface will have to cater to all classes of transport. It may not be eminently suitable for the fast motor traffic. But it is inevitable and admits of no possible remedy under the existing circumstances. The motor transport is no doubt increasing fast, but it can never replace the country cart which has its own place. Pneumatic-tyred bullock carts have been designed for use in the country. It might be that they do not wear out the roads, that the draught is reduced effectively and that they are in these respects highly efficient for transport of produce. But they are nearly three times as costly as the country cart *in normal times*, and the villager cannot simply afford it. Its use is restricted to the richer class, the community services and the various business and industrial concerns; the cultivator has not taken it up. Carts with deflated tyres cannot be used, proper pressure has to be maintained for preserving the life of the tread, the cart has to be protected from the sun and the weather when not at work, and repairs to tyres and tubes have to be attended to then and there: all these are beyond the capacity and means of the average villager. The poor *ryot* and his cart seem to be fixtures in the country's framework and it is against this background that any future development has to be planned, and this point is apt to be missed in an endeavour and even eagerness to make things progressive and speed up development.

Two things that merit the attention of the progressive industrialist have been singled out by Sir Kenneth, viz., the country cart and the indigenous water-lifts. Both of them are essential contrivances of a simple type and their basic simplicity, cheapness, service and ease of construction and repair in the villages without specialised skill and tools are a marvel; and unfortunately the modern engineer has not been successful so far in combining these several advantages in any improved design. Intense research is indicated; but there is no glamour about this type of work, spectacular results could not be expected and the problem has not gripped the imagination of the progressive, enthusiastic and ambitious research workers.

Absence of communicable roads is only one phase of the transport problem for the villager. An equally difficult, if not more difficult aspect of the problem is to provide himself with bullocks, feed for his animals, etc. The materials required for making carts and implements have become scarce and costly, especially iron which is almost unobtainable except at exhorbitant prices. Mr. S. V. Ramamoorthy, Adviser to H. E. the Governor of Madras, has indicated that the Madras Government are proposing to get 30,000 tons of iron and steel from the Central Government at controlled rates, and that these would be supplied to the cultivators for making carts and implements. That would give some relief. The high prices of cattle and feed are one of the many and varied effects of the war and we would wish that the war were won early, so that the people may be further spared from the effects of the vicious and demoralising spiral of inflated prices.

A Survey of Guava Cultivation in the Circars

By SYED IBRAHIM, B. Sc. (Ag.),

Horticultural Assistant

Introduction When "Grow More Fruit" has become the slogan of the day, a survey of a fruit crop such as guava, which is easily adaptable to a very wide range of climate and soil conditions and whose cost of culture and maintenance is cheap, is expected to be useful. Besides, such a survey was felt essential for making the guava varietial collection at the Agricultural Research Station, Anakapalle, comprehensive and exhaustive. Accordingly a survey of guava-producing regions in the Circars was undertaken in 1942, and the present paper embodies an account of the same.

Situation and nature of the tract The Circars lie to the north-east of the Madras province. The tract has a long period of dry weather, quite congenial to guava. With an annual rainfall of 50 to 60 in. in the hilly north and 30 to 35 in. in the plains of the south, the guava plantations enjoy the optimum precipitation range. Plantations of guavas are found mostly in well drained loamy soils. Guavas are also found to grow extensively in rich alluvial soil of the Kistna delta and red loamy soils of the Vizagapatam District. Extensive cultivation of this fruit can also be seen along the river Sarada in the Vizagapatam District, the river Kistna in the Kistna and Guntur Districts and the river Nalla Mada in the Guntur District.

Cultivation in the tract As the present survey's main object was the varietal study and collection, details regarding the area are not complete. However, figures got from the District Agricultural Officers of the concerned districts and in the course of the survey are given below:—

District	Area in acres
Vizagapatam	600
East Godavari	250
West Godavari	50
Kistna	350
Guntur	1,150
	2,400

Varieties and types No systematic classification of the varieties of guava has been done so far. Two distinct groups can be made out with the colour of the flesh as basis, namely—the white and the red fleshed types. The majority of the guavas belong to the white-fleshed group. Except one type known as the White Paria the rest of the whites are of good quality and go by the popular name of Calcutta guava. There is only one red type poor in quality and is known by the name of Red Paria. The White and the Red Parias resemble alike but for the colour of the flesh. A brief description of the guava types is attempted in this paper so as to enable the *ryot* to choose the right economic types or varieties for his tract.

A. *Calcutta types*

a) *Smooth peel types* i. *Meeranjee* This is a good commercial variety, the plant is a moderate sized shrub with pale green leaves. The fruit is big, round, smooth; peel light yellow coloured when ripe; flesh white, sweet, soft as butter, with few seeds and a strong flavour and weighs about 2 to 6 oz. Both the depressions at the stalk end and calyx end are of the same size. This variety bears in all the three seasons of the year. Fruits keep for 3 to 5 days.

ii. *Kurupum* This is a very good commercial variety; the plant is a moderate sized shrub with dark green leaves. The fruit is bigger than Meerangee, oval, smooth; peel golden yellow coloured when ripe; flesh white, medium sweet, soft as butter, with few seeds and weighs about 3 to 8 oz. The depression at the calyx end is 2 to 3 times bigger than at the stalk end. This variety bears in all the three seasons of the year and is a better yielder than Meerangee. Fruits ripen slowly and keep for 5 to 8 days.

iii. *Lakaram* Resembles in all respects Meerangee but for the medium size of the fruit with hard pulp inside which is sweet both when the fruit is ripe and unripe. The fruits keep for 5 to 10 days.

b) *Warted peel types—Kafri* A moderate sized shrub with green leaves and acute apex. The fruit is large, irregularly formed, warted and furrowed; peel golden yellow coloured when ripe; white fleshed with few seeds, moderately sweet, with little flavour. This variety stands transport best.

B. *Red Paria or Red Desi or Red Natu Jami* The shrub of this type is small with very small and dark leaves and is distinguished also by its habit of bearing more than one flower on the pedicel. The pulp is red with little flavour and is densely packed with seeds. This type is not economical to grow on a large scale.

C. *White Paria or White Desi or White jami* It resembles the Red Paria in all respects except for the white flesh inside.

The 'Calcutta types' seem to fit in the group of Pear-guava, the Red Paria in the Apple guava and the White Paria in the *Pisidium pumilum* as described by Firminger in his *Manual of Gardening for India*. There are also some other types like Neeradu jami, Seedless guava and Kasi jami which are seen as stray plants in some gardens.

Propagation and planting Propagation by seed is the common practice. Seeds are extracted from ripe fruits and are sown in the months of July and August in small raised seed-beds at a distance of one to two inches. Seeds take about 15 to 25 days for germination. The seedlings are not transplanted in nursery beds for hardening as in the case of other fruit trees but are directly lifted and planted out in small pits in the orchard, when they are 12 to 18 months old, at a distance of 15 to 25 feet from each other. Immediately after planting pot watering is done. Another watering

is given the next day and thereafter every alternate day for three months. Rarely manuring is done at the time of planting.

Later operations Watering is done in early stages on non-rainy days. The basins are small with no slope inside to keep off water from the trunk of the tree. A light pruning to remove the low-hanging and crossing branches is given whenever necessary. When the trees are young, inter-crops like *ragi, cumbu* and horsegram are grown in the Vizagapatam and Kistna Districts.

Bearing seasons The seedlings come to bearing in about the fourth year. If irrigated the trees bear throughout the year. But the chief bearing seasons in the Circars are as follows :—

1. *Tolakari Kapu or Mrigasira Kapu* (June-July) This season holds good in the Vizagapatam District only. Even there, a poor yield of about 100 to 300 fruits only per tree is obtained in this season. Owing to floods, this crop is not taken in the Kistna delta. The fruit of this season is not very sweet, but commands a good price due to the scarcity of the fruits in the market.

2. *Pedda Kapu or Sivarathri Kapu* (October-December) This is the main season and may extend up to February in the Kistna and the Guntur Districts. The yield may vary from 300 to 500 fruits per tree, but due to the glut in the markets the price secured is very low.

3. *Kotha Amavasya Kapu* (February-April) Because of the severe summer heat and poor yields, no special care is taken of this crop in the Kistna and the Guntur Districts. In the Vizagapatam District only, a small crop of the size obtained in Tolakari Kápu is got. Fruits fetch good price in this season also.

Harvesting and Marketing Fruits are harvested when they are half ripe. Harvesting is done by hand-picking from the lower branches and with an iron hook attached to a bamboo stick from the higher branches. In places where the market is near, the fruits are carried in *Kavadi* (two baskets tied one at each end of a small bamboo stick), and for long distances in carts and boats. Watching, harvesting and marketing are done by tenants. When fruits have to be sent to distant places like Calcutta, Puri, and Madras, middlemen intervene and snatch away a good profit. No systematic grading is done but rough sorting of big, medium and small fruits is often resorted to when the fruits are intended for export to distant places. The price of the fruit at the chief markets of Anakapalle, Rajamundry, Bezwada, Masulipatam and Guntur varies according to the availability of fruits in the market and the season. Generally, a basket containing about 50 big fruits, 100 medium sized fruits and 50 small fruits, is bought from the grower by the dealer or hawker at Rs. 0-8-0 to Rs. 2-0-0. The dealer sells the fruits after sorting at Rs. 3-0-0 for 100 big fruits and 0-8-0 for 100 small fruits.

Financial Return This differs widely from place to place. In the red soil areas of the Vizagapatam District and the dry sandy areas of

Masulipatam, where the Paria type is grown mostly, the annual income may be about Rs. 20 to Rs 30 per acre of 70 to 100 trees. In Anakapalle, gardens along the Sarada river, in the deltaic areas of the Kistna and in gardens along the Nalla Mada river the income may be about Rs. 100 to 150 per annum per acre of 50 to 80 trees which usually belong to the Calcutta variety.

Pests There are not many serious pests and diseases of guavas. The pests that do most damage are the birds, fruit sucking moths and scale insects. Birds are driven off by regular whatchmen or by the family members and sometimes by protecting the half-ripe fruits with dried leaves. Neither preventive nor control measures are adopted against fruit moths and scales.

Suggested improvements. It is evident from the survey that improvement is needed over a wide range, from selection down to the marketing of the produce.

Selection The first and the foremost attempt should be to replace the Paria type by the Calcutta guava types in order to improve the quality and increase the yields.

Propagation The *ryots* must be induced to grow vegetatively propagated plants, as such plants remain true to the parent in respect of quality and yield, besides bearing early.

Cultural practices Proper spacing and planting trees in lines by adopting the square or the quincunux method will enable one to have more plants in an acre. Root pruning is undesirable in open loamy soils as this is more or less a weakening process. 'Bending of branches' to bear more fruits is not a bad operation, provided it is done properly.

Irrigation and manuring From the experience gathered at the Agricultural Research Station, Anakapalle, it can be safely stated that manuring and irrigation induce more yields and increase the size of fruits.

Pests and diseases The importance of clean culture in the control of insect pests and diseases should not be overlooked. Infected branches should be promptly pruned out. Spraying with contact poison will check the scales and fruit moths.

Marketing Facilities for quick and easy marketing should be made through the agency of co-operative organisations. A system of grading of fruits has to be adopted so that the market value of fruits may been hanced.

Preservation and canning The surplus fruit may be profitably utilised for the manufacture of such well-known products like guava jelly and dehydrated guava. The development of these industries is bound to improve the economic condition of guava culture. It is reported that excellent guava jelly and canned guavas have been prepared by the India Fruits Ltd., Kadiam, and at the Fruit Research Station, Kodur.

Acknowledgement I am greatly indebted to Sri K. C. Naik, M. Sc., Fruit Specialist, Kodur, and Sri R. Vasudevaro Naidu, Superintendent, Agricultural Research Station, Anakapalle, for their very valuable suggestions and guidance in writing this paper.

A New Type of Jaggery Mould

By V. T. SUBBIAH MUDALIAR

Jaggery is made by concentrating sugarcane juice and allowing the resulting syrup to set hard. It is cast in various shapes - big buckets, balls of various sizes, slabs, small cubes, etc. Each cane-growing tract seems to have its preference for a particular type of mould. The choice of the mould-types may have been influenced originally by the type of cane grown in the tract, the keeping quality of the jaggery under the weather conditions prevailing in the consuming market, the fastidiousness of the consumer and the type of labour available for making moulds.

The Ordinary Mould The small "cubes" seem to be the most popular of the shapes. They are called "cubes", but are really frustums of square pyramids. Suitable shaped holes are cut in large numbers in wood and they serve as the mould for casting the "cubes". The concentrated cane-syrup is poured in the mould and after it sets, the mould is turned upside down and struck heavily with wooden mallets to shake the "cubes" out of the holes and they drop down. The "cubes" made all over the country are of the same shape, with wide variations in the size. The biggest "cubes" weigh half to a pound and the smallest a third of an ounce.

The moulds are generally made of *Babool (Acacia arabica), Vahai (Albizzia* sp.) and similar hard fibrous woods that can withstand the hard knocks given with wooden mallets to dislodge the "cubes". The moulds are about 15 ft. × 1 ft. 4 in. × 7 in., and would ordinarily have about 1,500 holes cut in it. The moulds cost (pre-war rate) Rs. 2-8 per hundred "cubes", inclusive of the cost of wood and making, at Coimbatore. The cost of the mould is high and cultivators prefer to hire the moulds during the crushing season, and avoid purchasing them. The moulds are heavy and difficulty is experienced in handling them. They tend to crack under the heavy malleting in the course of a few years. The frequent renewal of the moulds increases the capital outlay and the cost of making jaggery. Any improvement aiming at either reducing the cost of the mould on lengthening its life should be welcome.

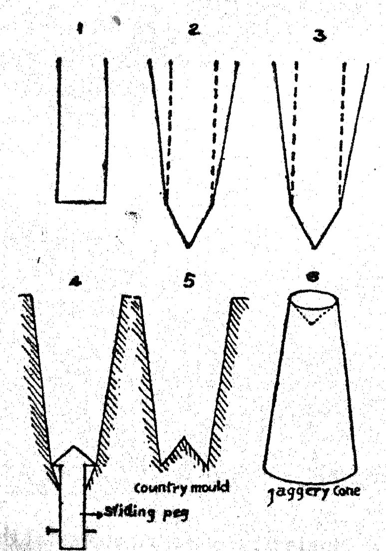
Attempts made to improve the mould have aimed at minor variations in the method of making, rather than at changing the shape of the holes. In the earlier years, the "cube" form was probably fixed upon as the only shape possible for the village carpenter with a few chisels to help him on. A tapering conical shape was not possible without the necessary tools.

The jaggery moulds have a flat pyramid provided at the bottom, called the *lingam*. The play of the chisel being limited by the narrowness of the hole, no other base is possible. No conceivable shape of the chisel could give a horizontal base.

The Peg-mould An improved type of mould appears to have been evolved a few years back, which may be called the 'Peg-mould', i. e.,

mould having pegs. The form and shape of the "cubes" made with both the ordinary and the peg-moulds are the same, but the pegged type eliminates the malleting done to shake the "cubes" out of the mould. Quality wood, free from knot and cracks is sawn into planks, planed to a thickness of $1\frac{3}{4}$ in. and used for cutting the mould holes. The holes run right through the wood and have a double taper as illustrated in Fig. 2. The hole at the bottom is closed by a sliding peg The peg has a small stem and is surmounted by the *lingam* When the mould is in position, the peg slides down and closes the bottom of the hole. The boiled cane syrup is poured in and it sets in a short time. The mould is then turned upside down and the pegs are pressed down lightly with the aid of a small plank about a foot square. The pegs in turn press the jaggery "cubes" and they drop down easily. The mould has the advantage of dislodging the "cubes" without the usual heavy malleting. The mould lasts far longer than the ordinary mould. The mould is further not heavy and is handled easily. The mould, however, costs Rs 4 to Rs. 4—8 per hundred holes and a mould with 1,500 holes costs Rs. 65 and the prohibitive cost makes the extension of its use impossible, more or less. It has not come into general use, though a few moulds are made here and there by enthusiastic people. The mould is alright as far as it goes and the problem is to reduce the cost of making the peg-mould.

The Round-mould The round mould that is now suggested as an improvement embodies all the main features of the ordinary and the peg-moulds. The frustum shape that gives a distinctive appearance to the cube-jaggery and that facilitates its extraction from the mould is retained, but the hole is circular and the resulting jaggery is in the form of a truncated cone and which may be designated the 'jaggery-cone'. In other respects, it is just like the peg-mould. But the change from the square to the round form alters the method of making the mould completely. The planks are cut to size, planed and the centres of the holes are marked on the upper surface. Augur bits, having the same width as the small end of the truncated cone, are used for drilling the holes preliminarily as in Fig. 1. The depth of the hole is the same as the height of the "cone". The hole is then tapered with a special bit having a double taper shown in Fig. 2 & 3. This bit is made with longitudinal grooves, more or less like the grooving in rose-head countersink bits. The taper bit is regulated to pass through



1-4 Stages in making the round mould

the wood and just make a mark on the other side The sides of the hole can be smoothened with a tapering sand paper block, made for the purpose. The plank is then turned upside down and the hole marked already is enlarged to permit the stem of a sliding peg being inserted. The hole then takes the final form, fig 4 The sliding peg, is made of wood with a thin stem and surmounted by a flat cone. The peg is inserted in the hole and prevented from falling out by puttng in a nail on the stem, an inch from the surmounting cone It provides a play of an inch for the sliding peg.

As has been seen, the circular mould is made in an entirely different manner. The technique of making the hole is a radical change and mould-making is speeded up. The drill makes the hole instead of the chisel and mallet. The mechanical efficiency of the hand is not such a big and important factor in making the moulds as in the case of the square moulds. A specially skilled workman turns out 80 holes in a day in the ordinary mould or 50 holes in the peg-mould. A skilled workman, not specialised, would drill a large number of round holes in a day.

With the size of wood and the labour for turning out the job reduced and the specialised workman set aside, the cost of making the moulds is bound to be considerably reduced. The precision in the round tapering holes, eliminates the possibility of "cones" sticking in the holes, as often happens in the squire holes, when the sides are lightly hollowed or bulged out. The round mould is likely to last fairly long with reasonable care.

The jaggery cones resemble the old cubes in general form and appearance and are not likely to be minded by the consumers, at least not after the novelty of the new shape wears off.

It is likely that small and minor difficulties will present themselves when the mould making is first attempted as with all new attempts, but they will, it is hoped, be overcome in the usual manner by local resource and talent.

Cultivation of Leafy Vegetables in the Northern Circars

By A. SANKARAM, B. Sc. (Ag.)

There is a great and real need for increasing the production of vegetables at present. With the present shortage of food grains, the use of large quantities of vegetables would to that extent relieve the pressure and make up the deficiency. Vegetables are valuable human food and our country is not having a sufficiency of vegetables in general. Among the vegetables, the leafy vegetables deserve to be placed high up in the list, as being highly valuable. They are rich in calcium, iron and other minerals and are therefore capable of making up the deficiency of minerals in the food grains, especially the polished rice and the various refined grain products. Also the greens abound in vitamins A and C, which are deficient in the staple articles of the South Indian diet. The greens may therefore be classed as highly protective foods. And the greens supply liberal

amounts of soft fibrous matter and bulk, which help the bowel action. All these together raise the metabolic efficiency,—digestion, assimilation, elimination of wastes from the system, final growth and maintenance of the health of the human system.

The common plants providing the leafy vegetables are the Amaranthus, the Indian Spinach and the *Gogu*. These are commonly raised by the market gardeners in the Northern Circars and the details of their cultivation are given under.

***Amaranthus gangeticus* L.** *Mokka or Perugu thotakura* (Telugu) and *Thondu keerai* (Tamil) The cultivation of Amaranthus is confined to garden land areas that have good irrigation facilities. They come up well in fertile, sandy and well drained loamy soils. The land is ploughed repeatedly—6 to 8 times – with a country plough to obtain good tilth. Beds 8 ft. by 8 ft. are then formed with irrigation and drainage channels in-between every two rows of beds. Small beds 4 ft. by 4 ft. are common in parts of North Vizagapatam.

Rotations and mixtures The Amaranthus crop comes up in rotation with *ragi* or any vegetable crop like brinjals or *bhendai* (Okra). Different species of Amaranthus are sown mixed in the same plot, also the Indian spinach, *gogu* and coriander sometimes Mixed crops are preferred, as the land available is limited in extent.

Season Amaranthus can be raised almost throughout the year. Three sowing periods are commonly recognised and by suitable adjustment of the sowings, a uniform supply of greens is provided for nearly a period of ten months in the year. The sowing periods are June, November and February. The first two season crops come up well and the February crop occasionally suffers for want of sufficient water supply.

Manuring The greens respond to heavy manuring. Cattle manure is applied up to 25 to 30 cartloads per acre. Sheep penning also is done in certain cases.

Sowings Sowing is done early in June for the *Tholakari* crop, in November for the Winter crop and in February for the Summer crop. The seed collected from the previous crop is used. Seed is collected from a few plants set apart in the field. The ripe and dried panicles are gently tapped and the seeds that shed are collected, winnowed and stored in cloth bags. Seed is also available in the local shandies for sale, at 12 annas per Madras Measure. Sowing is usually done in the cool evenings, preferrably after a rain. The seed is mixed with twice its volume of sand and broadcasted evenly over the prepared beds and lightly covered with soil. Two Measures of seed will sow an acre.

After-cultivation The seeds germinate in about a week and the plants put forth 3 to 4 leaves in a fortnight. Thereafter the plants make rapid growth, provided the supply of water is regular. The crop requires

copious irrigations and drainage is also equally important. The crop is weeded a fortnight after the sowings and hoed a week later. A second weeding is also done when necessary.

Harvest The crop is ready for harvest in 40 to 45 days from the date of sowing and it is done in stages. The harvest is spread over a period of three weeks and this ensures a steady and continuous supply of greens to the market. Further the sowings are also done in batches, in small areas each time, at intervals of 5 to 7 days. The harvest is done almost daily and the womenfolk themselves attend to the harvest and sale of the greens in the Vizagapatam District, without engaging extra labour.

Individual farmers cultivate up to a maximum of 30 cents of amaranthus. It costs Rs. 5 to cultivate an area of ten cents and the produce may be expected to be sold for about Rs. 10 to 12. Amaranthus is a popular green in the Circars and it finds a ready sale in the local markets.

Amaranthus gangeticus* L. *var. tristis—*Koyya thotakura* (Telugu) *Araikeerai* (Tamil). This is a variety of amaranthus which has a thin stem and a semi-trailing habit. This is cultivated just like the *Amaranthus gangeticus* mixed with other crops, and pure crops are not uncommon. This is raised in certain villages of the Vizagapatam District for providing fodder for work bullocks and buffaloes. It is supposed that the greens heat the system and reduces milk yields. It is not therefore fed to the milch animals. It is raised as a fodder in the same plot year after year, from January to August.

The *koyya thotakura* is considered inferior to *mokka thotakura* for human consumption and is available in the market at cheaper rates.

Amaranthus paniculatus—*Pedda thotakura* (Telugu), *Pungi keerai* (Tamil). This variety of amaranthus is very popular in the Vizagapatam district. The stems are very tasty and they are cooked and dressed in various ways The variety largely cultivated round about the village of Rega goes by the name of *Rega thotakura*. This is particularly valued in and around Vizianagaram and is always in good demand. While the rind of this variety is hard, the inner medullary portion is soft and sweet and is much appreciated by the consumers. Other varieties of amaranthus are not known to have this special characteristic.

Cultivation About half a Measure of seed sown in a 5 cents nursery will plant out an acre. Seedlings, 2 to 3 weeks old, are transplanted 1½—2 ft. apart either way in the main field. The seedlings planted in May are ready for harvest in October. When sold wholesale, the crop fetches Rs. 150 from an acre of the crop. Four to eight plants per anna is the retail rate in the market.

***Basella rubra* L.**—*Mattu batchalakura* (Telugu), *Pasalai keerai* (Tamil). This is the Indian spinach and the soil, tillage and manurial requirements are the same as those of amaranthus. Two crops are ordinarily raised, one in June and the other in November.

Sowing The green is raised as either a pure crop or mixed with amaranthus. Half a Measure of the seed will broadcast an area of 10 to 12 cents. Seedlings are also raised in nurseries and transplanted $1\frac{1}{2}$ ft. apart either way, by the middle of June. Ten to fifteen days old seedlings are used for transplanting. The crop may be given 4 to 5 irrigations in all.

Harvest Side shoots alone are harvested once in 10 to 12 days, in places like Bobbili. In general entire plants are pulled out just before flowering in other places, for sale in the local market. A plot of 10 cents will yield 80 to 100 baskets of greens valued at Rs. 10 to 12, and the cost of cultivating the area is about Rs. 5. The green is used in soups and is in fair demand.

***Basella rubra* L.**—*Pedda* or *Theega batchali* (Telugu) This trailing variety of the Indian spinach is grown for the market, in parts of East Godavari, round about Peddapuram and Pithapuram and to a limited extent, in the backyards of houses, in parts of Vizagapatam, round about Bobbili and Parvathipuram.

Cultivation Pits are made 10 to 12 ft. apart and 6 to 8 seeds are sown in each pit, in either June or October. *Pandals* are put up for the vines to climb and spread out. After the germination of the seeds, two or three vigorous plants are retained and the rest are pulled out. As these plants grow, they are trailed on the *pandals*. A *pandal* 20 ft. × 20 ft. will accommodate 4 pits. The pits are manured with cattle manure at 2 to 3 baskets per pit, a fortnight after sowing. The application of red earth to the pits is also common and it is said to accelerate the growth of the vines. The plants cover the *pandal* in $2\frac{1}{2}$ to 3 months, when the tender side branches are gathered periodically. Both the stems and leaves are used in making soups. The cultivation of this green is after all done to a limited extent only.

The Indian Sorrel *Hibiscus cannabinus* L., ***Gongura*** (Telugu), *Pulimanchi* (Tamil). The Indian sorrel is a tall undershrub which is cultivated extensively in the Circars and the Ceded Districts. The leaf is sour and is used largely for making chutney. The leaf obtained from a crop grown mixed with *Variga* in dry land is said to be the best for purposes of preservation. The leaf is fried with a small quantity of salt and kept in storage as a stock material for preparing chutney, when required.

The crop is deep rooted and is not exacting in soil, irrigation and manure requirements, like the other greens. It is grown in the dry soils, mixed with redgram, and rarely as a pure crop. The sowings are made in June, November and February. A pure crop requires 5 to 6 lb. of seed per acre. If the soil moisture is adequate at sowing time, the crop may be expected to come up well with the usual rains. The leaves are picked once a week, from the eighth week onwards for about $3\frac{1}{2}$ months. A plot of 10 cents will yield greens valued at Rs. 6.

SELECTED ARTICLE

Soil Physics: Theory and Practice* (*Abstracted*)

By Dr. B. A. KEEN, F. R. S.

I. SOIL PHYSICS : ITS SCOPE IN AGRICULTURE

Agricultural science as we understand it today is a young growth. It is only in the past 25 years or so, that any considerable number of trained and competent scientists has been engaged in agricultural research, and with rare exceptions the agricultural laboratories have not celebrated a Golden Jubilee. The soil physicist was a relatively late arrival; there was no physicist on the Rothamsted staff until 1913.

The primary contribution of physics to agricultural science is obviously in the study of the soil, its physical properties, the laws governing the retention, movement and loss of water, and the bearing of these laws on plant growth. The practical applications of this knowledge largely concern the operations and their effect on soil moisture and on plant growth. Those are the main subjects embraced in soil physics: theory and practice.

Soil is, from the physical view point, a mixture of particles of all shapes and sizes ranging from sand grains and rock fragments a millimetre or so in diameter down to minute particles of clay or clay—like minerals. Every one knows the difference between a clay soil—a heavy soil as the gardener or farmer calls it—and a light or sandy soil: the latter has more coarse and fewer fine particles than the former. The Agricultural scientist requires a more exact and more objective specification than the term 'heavy' and 'light' and this has been met by the method known as the mechanical analysis in which the particles are sorted out into a number of groups of decreasing size.

In all methods of mechanical analysis the soil is mixed with water and treated to disperse any clusters or aggregates into their individual particles. The coarser particles are then separated under water by sieves of suitable mesh, while the small ones are graded by using the fact that the smaller the particle the more slowly it sinks in still water.

The table below gives the group names, the range of settling velocities and the equivalent radii of the particles, calculated from Stokes' Law, assuming that every soil particle is a perfect sphere. The equivalent radius is a convenient fiction which provides a more concrete picture of particle sizes than does the velocity of fall in water.

Name of group	*Range of radii mm.*	*Upper velocity of group—cm. sec.*	*Log. v*
Coarse sand	10—0·1	350	2·54
Fine sand	0·1—0·01	3·5	0·54
Silt	0·01—0·001	0·035	$\bar{2}$·54
Clay	Less than 0·001	0·00035	$\bar{4}$·54

The characteristic property of coarse and fine sand fractions is their inertness. Soils containing high proportion of them hold little water and are of low inherent fertility. Nevertheless they are an essential constituent of soil. They keep it open and thus improve the natural drainage, aeration and ease of cultivation.

The silt particles pack more closely together than any other soil constituent. Soils containing much silt—15-20%, are difficult to work and drain. Liming has

* Cantor lectures delivered on 19th and 26th January and 2nd February 1942.

little effect on silty soils as, unlike clay, silt does not possess marked colloidal properties.

Clay is the most distinctive of all soil constituents. It is the weathered and chemically reactive portion of the soil, while others are inert. It displays marked colloidal properties Its most striking property is the power to form crumbs or aggregates, consisting of many individual particles bonded together. Clay soils are retentive of water and drain only slowly. They warm up less rapidly and cool more slowly than sandy soils. They offer high resistance to cultivation implements. When wet, clay soils tend to become sticky and shrink on drying.

Much work has been done on the properties of the soil in bulk. The goal has always been what may be called a 'single value' measurement; some experimental procedure in which an outstanding physical property, or group of properties, would be specified by one numerical value, and thus serve as a simple means of grading or classifying soils. Such single values can clearly have only a general significance.

One difficulty that besets the prediction of soil behaviour in the field from the results of single value determinations is that many of these necessitate the soil being in a finely divided condition. The natural crumbs have to be broken down mechanically and the main characteristic of the field soil is, therefore destroyed. The crumbs are aggregates of individual clay particles in which some inert and larger particles may be enmeshed and they are permeated by minute interstices. Between the crumbs there are larger pore-spaces. Thus the soil interstices consist in essentials of a micro-pore-space in the crumbs and a macro-pore-space between them. In this pore-space water moves or is retained under the influence of gravity, evaporation and absorption by plant roots; within it also the soil air, which is richer in carbondioxide, inter-diffuses with the outside atmosphere.

The Capillary tube hypothesis and its failings In their attempts to explain the water relationship of soil, the earlier workers missed the implication of these two sets of pore-spaces. They used the simple fact that the soil was porous and pictured it as a set of capillary tubes: irregular in width, length and direction, it was true, but none the less capillary tubes, to which the simple and familiar tube formulae from pure physics could be applied. The result was the general belief that when the soil moisture content was reduced by evaporation or plant absorption, water was drawn up by capillary attraction from the ground water table to replace it. The hypothesis also gave an apparently sound scientific explanation of the effects of hoeing, harrowing and rolling. This emphasis on the direct association of the ground water table with agriculture persisted in spite of the failure in laboratory experiments to get water to rise more than 3 feet or so even in fine textured clay soils. This difficulty was comfortably dismissed by assuming that the packing of the soil in the laboratory was different from that in the natural field conditions. But experiments conducted over a long period at Rothamsted showed that even after several months of practically continuous evaporation conditions the water level sunk only about 3 feet in the clay soil, about 2 feet in fine sand and just over a foot in coarse sand. The above discrepancy between the experimental results and the original theory could not be easily set aside. Actually the soil-water largely remains *in situ*, as it meets the changes by automatic alterations in the curvature and thickness of films of water about the soil particles. Soil water is resistant to changes and is not drawn from wetter to drier regions, as asserted by the capillary theory.

Some fallacies in drainage and irrigation The failure to understand the role of water in the soil has led to certain erroneous ideas and practices in land

irrigation and drainage. In many experiments laid out to determine the optimum quantity of water and spacing between irrigations, it was assumed that the added water distributed itself uniformly throughout a considerable depth of the soil so that the moisture content is everywhere raised from its previous value to a new one. This is not what happens. In the immediate vicinity of the ditch the soil pore-spaces become quickly saturated. The film curvature in the adjacent pores is disturbed and water passes into them from the first set, which are replenished from the water in the ditch. The process continues until all the water in the ditch has entered the soil. At this stage the soil around the ditch is saturated; the volume of saturation depends on the amount of added water and the initial moisture content of the soil. Then there follows a much slower redistribution, in which the saturated cells part with some of their water to emptier cells adjoining the saturated zone, and the action extends back slowly into the saturated zone itself. But this process cannot, over any reasonable space of time, reduce the moisture content to a point lower than a value called the "field saturation capacity," which, for practical purposes, represents the moisture content that the soil can hold against the pull of gravity. So, ultimately, an application of irrigation water wets a certain volume of the soil up to the field saturation capacity. Beyond the boundary of this zone the moisture content may be appreciably less, but appropriate curvatures in the waterfilms will maintain approximate equilibrium between the wetted volume and the adjoining soil.

A 5 ft. depth of freely draining soil holds the equivalent of at least $7\frac{1}{2}$ in. of rain which, with the rain that falls in the growing season, is more than ample for the water requirements of plants. Roots of the common agricultural crops given fair conditions will ramify throughout most of this depth. Remembering that the maximum height of capillary rise, even in heavy soil, is shown by Rothamstead experiments to be only 3 ft., it follows that if the water-table level is lower than 8 ft., the sum of these two values, it is in practice incapable of supplying water to the plant roots. If the water-table level be less than 8 ft. below the surface, it is true that in long droughts the plants may get some of the water. But it is equally true that in wet periods the water-level will often rise into the 5 ft. zone, temporarily checking root activity and causing deterioration in the soil structure. We may therefore take 8 ft. as a fair figure for the critical value of the water-table depth. Soils with a higher water-table than this may well "derive benefit or avoid danger" as a result of new drainage works.

II. SOIL CULTIVATION: ART OR SCIENCE?

Soil tilth The pore-space in the soil is essentially cellular in nature. There are relatively large pores connected together by narrow necks, easily visualised in the case of sandy soils. These pores are the macro-pore-spaces. In the clay soils, aggregates of small particles of clay exist and the aggregates behave like individual particles. There are pores, relatively small, in-between the small ultimate clay particles constituting the aggregates and these pores are the micro-pore-spaces. The pattern of the macro-pore-space between the crumbs and the micro-pore-space inside the crumbs is highly developed in clayey soils. A soil in good tilth—that is in a definite crumb structure—is immediately recognised by the farmer and similarly its converse also—bad tilth, where the structure is destroyed.

Recent researches have led to some interesting conclusions regarding crumb formation: (1) the particles must be less than 0·0005 mm. in diameter, (2) crumb formation is connected with the active or negatively charged spots on the clay and the base exchange capacity of the clay is a measure of this property; (3) these exchangeable ions must be small; (4) Crumbs are formed from the wet

clay when the liquid is removed by drying, or by freezing and (5) the crumbs do not form with every liquid. When all these conditions are fulfilled, crumbs will form, the clay particles and the exchangeable ions being held together by water bridges or chains. The water molecules may be regarded as 'bound' to the clay in the sense that in this condition, their properties are somewhat changed from those of water in bulk. Crumbs do not disintegrate when re-wetted and they are known to have a degree of stability.

Stability shows itself in one or both of two forms—mechanical and water stability. By the former we mean the resistance to mechanical forces of rupture such as the pressure of strong winds, the impact of a rain drop, and certain cultivation operations. In general mechanical stability is assured if there is enough colloidal material present. Water-stable crumbs retain their individuality when wetted with water. They will swell and alter their shape, but will not fall down to paste: when the excess water is removed the soil remains in crumb structure Soils which contain exchangeable sodium ions are not water stable.

Rapid drying and rapid freezing produce small crumbs. An increase in the salt content of the soil also reduces the crumb size. A study of the crumb structure of soils in natural conditions is one aid in deducing the history of their formation and in classifying them into types and groups.

Weather and cultivation implementsas factors in tilth production Cultivation implements have little direct control over tilth production. Their main function is to leave the soil in the best condition for the weather to act or conversely to complete the effect of the weather. The lumps are permeated by lines of weakness already created by preceding weather conditions, and when the harrow teeth, for example, strike the lumps and compress them against one another, they break down along these lines of weakness. To some extent the disc type of implement is an exception in that it does produce more direct disintegration than the standard implements. If owing to unfavourable weather, the soil is in an unkindly condition and seed-bed preparation is behind-hand several harrowings with disc harrow will produce a passable seed bed, when other methods would fail. A tilth of this kind is appropriately referred to as a 'forced' tilth.

Ploughing produces a shearing action on the soil and accentuates within the clods any incipient lines of weakness along which disintegration will later proceed; but it does not necessarily produce any considerable comminution at the time. The breaking down of clods to a tilth is connected with alternations of drying and wetting of the soil. The explanation is that during shrinkage the stresses produced when the particles closely approach one another, set up strains within the block which give rise to lines of weakness. The air absorbed on particles' surface in the later stage of drying is evolved suddenly when the block is re-moistened and produces small fissures along the lines of weakness. Thus alternations of wet and dry spells during the winter will shatter down an initially plastic clod of soil into fragments.

Cultivation and the control of soil moisture The operations most concerned are hoeing, barrowing and rolling. The capillary explanation of the function of harrowing and hoeing was that the top ends of the narrow capillary tubes were severed and replaced by the large pore-spaces of a loose soil mulch. The water was therefore unable to travel higher than the bottom of the mulch and thus its evaporation into the air was prevented. There are fundamental objections to this view. In the first place the vast majority of the soils are self mulching i. e., they automatically form a dry surface layer during periods of sustained evaporation. It follows logically that hoeing and harrowing are redundant operations in the direct conservation of soil moisture. In the second place the correct

theory of water movement explained already showed that the water films resist movement by adjusting their curvature to suit the changing suction of pressure deficiency. When evaporation occurs from a moist soil the water films at and very near the soil surface become attenuated to a sharper curvature. There will be local readjustment of the moisture distribution in response to the change but little or no upward movement of the water. In sequence water films a little deeper in the soil will decrease in volume and increase in curvature because they part with their water as vapour, which diffuses through the pore-spaces into the atmosphere. The result is that an air dry layer of soil is formed which gradually increases in thickness; below it there is a very narrow transition zone where the film curvature is affected by the high pressure deficiency of the air dry layer immediately above; below the transition zone the moisture films remain relatively unaffected by what has happened above.

The primary function of hoeing is to destroy weeds, which compete with the crop plants for food and water. This competition is much more serious in the early stages of growth than is usually supposed. A secondary function of hoeing and harrowing is of some importance on those soils that form a surface cap or crust when they dry out; in addition to root injuries caused by the contraction of the crust, the large cracks between the clods afford a ready way of escape for soil moisture from below. Cultivation at the time of incipient crust formation will shatter the soil into small pieces and avoid both these dangers. Thirdly, surface cultivation at frequent intervals, by inhibiting the growth of shallow roots, might possibly encourage deeper rooting, but this requires to be tested out.*

The traditional explanation of rolling was that by compressing the top layers of soil it reduced the average size of the voids which were thus able to draw water by capillary action from the larger voids below the compressed layer. However for this action to occur, the moisture content of the soil would have to be so high that no practical man would order the operation for fear of damage to the tilth. The real effect of rolling is to press the soil closer around the roots of the young plants. Alternations of wet and dry weather cause a loosening of the soil and freezing causes the soil to "heave"; both these causes loosen the hold of the young roots on the soil. Rolling presses the soil back into contact with the roots.

In the above explanation of hoeing, harrowing and rolling there is inherent a view of the manner in which the plant roots gain access to soil moisture. The capillary theory conferred on the soil the active role in the duty of supplying the plant with water—that of water moving from higher to lower moisture regions. But in reality the plant roots themselves go in search of the moisture because the adjustment of films of curvature prevent more than a limited movement of soil-water. At the beginning of the growing season moisture up to the field saturation capacity is stored in the soil in the micro-pore-spaces of the crumbs, which can be looked upon as little reservoirs, and in films around the boundaries of macro-pore-spaces between the crumbs. Even a reputedly shallow-rooting plant like barley sends down its roots to 5 ft. below the surface. Hence, the extensive root range of plants and the capacity of the soil to store moisture

---

* It might be possible fourthly that the surface cultivation at suitable intervals favours weathering and the conversion of the plant food in the soil into soluble forms appropriate for plant feeding. Possibly also the soil nitrogen and the changes it undergoes in the soil are influenced, *vide* inter-row cultivation effects, pages 294-295. The low nitrogen plots are benefitted by frequent hoeings, but not the high nitrogen plots—in some cases the effects were even negative. (*Ed*).

are complementary functions which together will meet the normal water requirements of the crop.

III. CULTIVATION AND CROP YIELDS

Traditional views in Britain The evidence marshalled justifies the revision of the older views on the relations between the soil and its water content. One conclusion was that *cultivation does not have any important direct effect in controlling the moisture content*, although a great body of tradition asserts the contrary. To the practical men, the cultivation was one of the means of growing the best crops and experiments were started at Rothamsted to prove the obvious—good and thorough cultivation resulted in good crops, and to confirm the views held by practical men: falling off in yields is produced by insufficient cultivation. Slowly, but surely, we have been forced to revise our ideas, for the results have shown that *yields are remarkably insensitive to variations in cultivation.*

RESULTS OF MODERN EXPERIMENTS

Sub-soiling Subsoiling appears to be an unnecessary and unprofitable operation on the Rothamsted soil possibly because the sub-soil although a heavy clay has natural fissures down which surplus water can escape and roots can grow.

Extra ploughing It is generally held that ploughing in autumn and again in spring is desirable in preparing for root crops. Two experiments were conducted and a practical outcome, reinforced by a number of observations later, is that autumn ploughing could be omitted without harm and when given the spring ploughing is seldom needed, at Rothamsted.

Depth of ploughing Deep ploughing has a better effect when the land is weedy. Shallow ploughing is on the average as effective as deep ploughing (Rothamsted results).

Comparison of ploughing and grubbing When the land is not weedy the grubber can replace the plough for a season or so without detriment to the yield. The grubber is not able to control the weeds as efficiently as the plough.

Comparison of ploughing and rotary tillage If the land is clean as it usually is after a root crop any method of getting a reasonable tilth quickly can be used. The depth of the tilth is not very important provided it is clean. Though yields may be less with rotary cultivation, the reduction is small and may be offset by economy of time and labour.

Degree of consolidation of seed bed Experiments were designed to test whether heavy rolling of a seedbed would have any effect on yield. Rolling improved the stand and early growth, but not the yield. The result showed that quite striking differences in the early growth do not by any means imply that there will be corresponding differences at harvest time.

Intercultivation of root crops With kale, sugar beet and potatoes, the control plots were given the normal number of inter-row hoeings in a number of experiments and the other plots were given extra hoeings. Intensive cultivation produced significant reduction in yield. The extra labour and cost of cultivation were wasted and smaller crop was obtained, in general, in most cases.

Certain experiments were designed to answer the question whether hoeing has any effect on crop yield beyond that attributable to weed destruction. Hand pulling of weeds was compared with hoeing, with two levels of nitrogenous manuring. Hoeing was superior to hand pulling in every case, which would suggest that the operation of hoeing contributes something besides the mere destruction of weeds. Part of the superiority was however due to the hoe being more effective against weeds. Extra cultivation produced increases in yield in

the low nitrogen plots ; the increases were less in the high nitrogen plots and in some cases even negative (Woburn, Rothamsted and Chertsy results).

American results A number of American results were considered. They were in close agreement with the results discussed above. With the bulk of a large number of experiments, comparing normal cultivation and surface scraping, there was no advantage of normal cultivation over surface scraping. The obvious conclusions are that the general statement that hoeing is beneficial is inapplicable as a generalisation, and that the primary effect of cultivating to produce a soil mulch is in reality weed destruction.

The tradition of good cultivation The extensive discussion given above has covered a wide variety of operations and a wide range of conditions. The results, even on a cautious interpretation, lend no support to the idea that extra cultivations increase crop yield: they show that, provided (a) a reasonable seedbed is obtained, (b) weed competition is prevented during the early growth of the crop and (c) the worst of the weeds are kept down afterwards, then any work in excess is wasted and may even be harmful as far as the crop yield is concerned. On the other hand, they do emphasise the importance of choosing the right time for cultivation.

It may well and rightly be asked, if this be so, how was it that the tradition ever grew up? The following explanation may be provided. The old agricultural system favoured weeds, the implements were clumsy and inefficient and frequent cultivation was the only hope of the farmer; this was possible with the cheapness of labour. Further horses and bullocks used for draught did not cost more, when worked. Even when efficient tools were devised in later years, the old tradition of 'keeping the hoe moving' was maintained. Things have changed; labour is costly; power hauled implements have come to stay in the farm and the more they are used the greater is the running and depreciation charges. There is no place now for cultivation based on custom and tradition. What is necessary should be done, but parsimony as well as extravagance in cultivation are economic blunders in farming today.

Conclusions The bulk of the experiments discussed were done at Rothamsted and Woburn. The practical results were brought to the notice of the farmers by the agricultural press, lectures and addresses. In all these, stress was laid on this central point. No claim is made that many cultivation operations, now accepted as necessary, are a waste of time and money on all soils. It is also urged that in view of the results obtained at Rothamsted and Woburn, other soils should also be examined in a similar manner.

The response to this proposal has been disappointing. Possibly because there is nothing advertisable in our findings and that has a sale value in the market like the improved manures, sprayers, implements, feeding stuffs etc. The change in cultivation technique, the consequent saving in expenditure and their application are subjects for demonstration and education and it is the business of the State, for nobody else can be expected to be interested in the dispersal of such knowledge.

Agricultural research has made vast strides in this century. These also show that generalisations could not be made from a set of results based on one soil, climate, agricultural system etc. The results need not necessarily be valid elsewhere. For rapid changes that may have to be made in post-war agriculture, a reliable basis with field experiments on a national scale would be necessary. This is the immediate need of the day. C. S. K. *(J. Roy. Soc. Arts, Vol. 40, 546—579, 1942.)*

Abstracts

Improvement of the Nitrogen of Soils and the Origin of Soil Nitrogen by Prof. N. R. Dhar (*Nature, Vol. 151; May 22, 1943*). It appears that the fixation of atmospheric nitrogen can take place in the soil not only with the help of Azotobacter, but also in the complete absence of bacteria as a surface process aided by sunlight; the chief source of nitrogen in soil in all countries is this type of fixation and not that supplied by the leguminous plants as is believed. Even when sterile soil containing various carbohydrates is exposed nitrogen is fixed. The fixation takes place even in darkness, but at a retarded rate. The carbonaceous matter is oxidised and the energy liberated leads to the fixation of atmospheric nitrogen. When bacteria are present in the soil, the rate of fixation of nitrogen is greater than in the case of sterile soils.

The fixation of atmospheric nitrogen is brought about in a similar manner when mineral surfaces are exposed under identical conditions. The efficiency of fixation is greater with minerals than with soil. The fixation of nitrogen is opposed by loss due to nitrification, as both the processes are at work simultaneously. Ammonium nitrate, which is unstable, is formed during the nitrification of the proteins and other nitrogenous compounds produced by fixation or originally present in the system. In soils, there is a stock of combined nitrogen, which is also subject to a certain amount of loss. Hence the nitrogen lost is greater in soils than in minerals and the sum total of nitrogen added is greater in the case of minerals and therefore the greater efficiency of the minerals.

The parent materials from which soils are derived are pure mineral substances. They do not contain organic matter, but may have traces of nitrates and ammonium compounds, sufficient to promote the growth of algae primarily. The algal matter offers the nuclear organic matter for oxidation and fixation of nitrogen consequently. In course of time the stock of nitrogen increases, as also organic residues resulting from photosynthetic activity and fertile soil is eventually formed. The fixation of nitrogen is rapid in the beginning and as the stock of organic matter and nitrogen increase. the process slows down and a balance or normality of nitrogen content is attained depending upon the climate. The fixation of nitrogen in the minerl matrix induced by the oxidation of organic matter in the presence of light plays a prominent part in the formation of soils in general.

The residual effect of cow manure may be due not mainly to the conservation of nitrogen as is believed, but to the fixation of atmospheric nitrogen through the oxidation of the carbonaceous material present aided by sunlight.

In Indian soils under cultivation, the total nitrogen is much lower than in soils of temperate climates. The prevailing high temperature and the intense sunlight accelarate the oxidation of carbonaceous and nitrogenous compounds in the tropics, thus entailing loss of nitrogen by nitrification of the nitrogenous compounds in the soil. When the land is covered with vegetation such losses are reduced and nitrogen content is raised, as in grass lands. When cultivation is taken up again, the nitrogen content falls down to the normal. By the addition of organic matter, the nitrogen content is raised both due to the fixation of atmospheric nitrogen and to its conservation in the soil.

The intense sunlight and heat prevailing in the tropics make available greater quantities of nitrogen from the soil than in the temperate climates. The available nitrogen in tropical soils is 10—30 per cent of the total nitrogen (0·04—0·05 %), while it is only 1—2 per cent of the total nitrogen (0·1—0·2 %) in temperate

soils. That explains why under unmanured conditions, a better crop is had in the tropics than in the temperate regions. By adding molasses or other easily oxidisable carbonaceous substances to the soil, the nitrogen content of the soil is improved by nitrogen fixation. The content of ammoniacal, nitrate and total nitrogen are the highest a month or five weeks after application of molasses and that is the time for sowing the crop in the field for best results. V. T. S.

Tomato cultivation in the College Farm by B. F. Topper (*Tropical Agriculture, Trin Vol. 19, No. 9, Sep. 1942*) The seeds are sown in nurseries in early November, using one ounce of seed for two square yards. They are covered by sprinkling over a thin layer of soil and this is compacted by beating with a piece of board. One ounce contains 9,000 seeds and gives 4,140 seedlings on the third day and 965 transplants five weeks later. The beds are watered and covered with coconut leaves. The shade leaves are removed to structures above the beds, when the seedlings come up. The shade is removed when the seedlings are strong enough. When the seedlings are one or two weeks old, they are pricked out 4 or 5 inches apart in manured beds. Water is applied sparingly during the last week to harden the plants.

Transplanting is done in early December when the seedlings are 5—6 weeks old. Bamboo stakes 6—8 ft. long are planted firmly 4—6 in. away from each plant. In 1942, with plants on ridges 3 ft. apart, 1 ft. spacing was significantly better than 1½ ft. spacing, which in turn was better than 2 ft. spacing. Staked and pruned plants did better than unstaked and unpruned plants.

Pruning Early in January the plants were tied to stakes with the inflorescence away from the stakes, to avoid the fruits getting bruised, and the side branches were pruned. The pruning and the tying of the plants is attended to once a week. When the plants are four months old, they get out of reach and are then topped, but a side branch is allowed to develop in place of the main growing shoot.

Manuring Compost is ploughed in, at 10 tons per acre preliminarily. Mixed fertilizer ($1N:4P_2O_5:3K_2O$) at 1,260 lb. per acre is applied in three monthly instalments, the first after transplanting placed in holes 6 in. away from the plant. Each plant receives on the whole about 2 oz. of artificial fertilizer mixture.

V. T. S.

Food Yeast by Dr. A. C. Thaysen (*Nature, Vol. 151, April 10, 1943*) During the last war it was shown that proteins could be synthesised from inorganic salts, including ammonia, by growing yeast in worts containing sugar as the only organic substance. In 1915, Hayduch reported that he had succeeded in synthesising protein using ammonia in the process with the help of an yeast—presumably a species of Torula—which produced little alcohol only, when compared to others. It may be claimed that yeast-protein is only slightly inferior to animal protein. It is also known that yeast constitutes the most valuable source of water soluble B vitamins.

Work on production of yeast was commenced by the Department of Scientific and Industrial Research in the chemical research laboratory at Teddington (Jamaica) in 1940. A polyploid strain of yeast, provisionally named *Torulopsis utilis* var. *thermophila*, was found suitable for the purpose. This strain is bigger in size than the ordinary yeast, facilitating the separation of the cells from the culture medium and is capable of developing under conditions prevailing in the tropics. During the usual nine hour growth period at Teddington, this strain produces a fifteen-fold increase in the weight of yeast introduced as the inoculant. The yield of dry yeast produced at the pilot plant is 30 per cent on the molasses used, containing 50 per cent sugar. The yield of protein in the yeast, calculated on the inorganic nitrogen supplied, represents almost theoretical conversion.

The yeast produced is carefully washed and the pure yeast suspension is passed over drying rollers, resulting in light straw coloured thin flakes, named "Food-Yeast", having a pleasant meaty and nutty taste. The Food-Yeast has a protein content of 45–50 per cent and is a potent source of B vitamins, of which it contains the whole range known. It is readily miscible with water, milk, etc. It could be mixed and baked with loaf and biscuits. It is estimated that this could be put in the market at 6d. per lb. and a daily intake of half an ounce per head is contemplated. It is stated that in suitable cases, when Food-Yeast was given with added ascorbic acid, improvement in or disappearance of some pathological senile features was noticed.

It may be claimed that Food-Yeast can supplement a diet lacking in animal food and should be particularly valuable in occupied countries, where there is bound to be animal food shortage during the post-war reconstruction period. Yeast production can be completed in hours, if a certain amount of carbohydrate food is set apart for it, while meat production may take as many years. One acre of a carbohydrate crop can yield 840 lb. of yeast protein or 70 lb. of meat or milk protein. The proportion of vitamin B would be much higher. At present prices meat protein would be 5 times dearer, milk protein 8 times and egg protein 24 times, when compared to yeast protein. The B vitamins of meat and milk protein would be 25 times and egg proteins 80 times than those of Food Yeast.

V. T. S.

Gleanings

Vegetables for the fighting services Large quantities of vegetables and potatoes are now being produced in several provinces to meet the needs of the Defence Services and remove the disturbing effect which large Army demands inevitably have on the ordinary market meeting civilian needs.

Over a year ago certain provinces had embarked on their own schemes to meet Army requirements, and in January this year the Central Government initiated a general scheme under which each province would arrange for the production of enough vegetables for all the forces located within the province.

The quantity of potatoes needed in different areas was worked out as well as the different varieties and proportions of fresh vegetables needed for Indian and British troops. An order for 30,000 lb. of European type vegetable seeds was placed in the U. S. A. and (most of it) has already reached India.

Madras has started three schemes located in the Vizagapatam District, the Nilgiris and at the Hosur Cattle Breeding Farm. The first-named scheme should be able to meet Army needs in the surrounding area.

The Nilgiri scheme will supply fresh vegetables to various military stations throughout the province, while the Hosur Farm aims at supplying 1000 lb. a day from now onwards.

Arrangements have been made to supply 29,000 tons of potatoes from the Nilgiris to meet the needs of the Army, of dehydrating firms and of the services in Ceylon. Three thousand two hundred acres are being put down to produce 12,000 tons this year. This will, to some extent, replace the large quantities that are now taken from supplies which, in normal times, are consumed by the civil population. *(Indian Information, Sept. 1, 1943)*

Coconut butter Coconut butter is being very largely used in place of dairy butter in the United Kingdom and France, and, before the war, it was largely

used in Germany. It can be used wherever dairy butter is used. Here is the process:—Grate or grind in a mill the meat of the nut as fine as it can be ground, and for the meat of each average nut add a pint of boiling water. Put this in a press, so that the milk can be squeezed out separate from the pulp. This milk can be used in place of cow's milk for any purpose, and is specially good with stewed fruit. To make butter, this milk can be separated in a separator, or let stand in a pan to let the cream rise, which it should do in about the same time as the cream in cow's milk. This can be set to ripen and churned in the usual way. The whole process is in every respect the same as in making dairy butter. Wash out the buttermilk; add salt to taste. As a rule, this butter is white, and annatto colouring can be added. According to the size of the nuts, it should take from six to ten nuts to make 1 lb. of butter. The churning should be done in a cool temperature say, between 60 to 70 degrees. *(Agri. J. Fiji, June 1942)*

The manufacture of coconut oil from fresh coconut meat An interesting account of a process for extracting oil directly from fresh coconut meat without its conversion into copra, is given in the *Philippine Coconut Journal* by Pedro E. Torres. The author claims that oil extraction from copra suffers from several disadvantages of which the chief are:—

Despite utmost care in handling and storage, the oil produced always contains free fatty acids and is usually discoloured thereby requiring additional refining operations. The only by-products are copra meal and cake which are dirty and become rancid and can only be used for animal feeds.

He describes the necessary processes for direct oil extraction in chronological order and indicates types of equipment already in use for other common industries, that may be used for each purpose. He also indicates uses for by-products. Claims are made that the process is commercially feasible but no manufacturing costs are mentioned. *(Agril. J. Fiji, June 1942)*

The conversion of coconut oil into a solid crystalline mass. While engaged in the study of thermal decomposition of coconut oil, J. Banzon (*The Philippine Agriculturist Vol. XXVI, No. 5, p. 399*) observed that a particular catalyst had the unique property of converting coconut oil into a crystalline solid mass. The process is the simple distillation of coconut oil with ferric oxide or finely divided iron. The distillate thus obtained is dark yellowish with a bluish flourescence. On cooling, it sets to a crystalline greenish—yellowish mass, which may be purified by repeated washings with methylated spirits.

The purified product is a light, white, crystalline powder, tasteless, and with a faint odour similar to stearic acid. It melts sharply at 55°C., to a clear transparent, colourless liquid, and solidifies to a hard, rather brittle, crystalline solid. Owing to its close resemblance to paraffin, this solid may possibly be used interchangeably with the latter, as for example, in candle making. *(Agrl. J. Fiji, June 1942)*

Tamarind seed, a new sizing material How tamarind seed can be employed as a sizing material for cotton yarn, thereby replacing the starch obtained from materials now required more urgently as foodstuffs, is described in an article recently published in the *Indian Textile Journal* and now reprinted by the Forest Research Institute in their series of *Indian Forest Leaflets*. Mill trials suggest that these seeds will be used permanently for the purpose and not merely as a wartime measure. Hitherto, while large quantities of tamarind have been consumed in India, no use has been found for the seeds. *(Indian Information, Sept. 1, 1943)*

Hints for bee-keepers

For November, 1943

The prosperous season for the bees generally commences from this month. With the advent of the North East monsoon, ideal weather conditions for bee activity prevail and there is luxuriant vegetation everywhere. An abundant supply of pollen is available from *Periamanjal cholam* and sometimes from maize and *cumbu* also. The supply is augmented by a few other minor sources like safflower, sunflower, niger, brinjals, *Peltophorum* etc. Adequate quantities of nectar are collected from a variety of plants like sunflower, safflower, niger, bittergourd, dhaincha, fiddlestick tree (cetherexylon sp) sandal, soapnut (sapindus sp.) and from the *cholam* shoot bug. In response to the prevalent favourable weather and pasturage conditions, bees exhibit remarkable indoor and outdoor activity. Comb construction begins and the rate of breeding is accelerated. Comb-foundation sheets or old combs may now be given with advantage. The month is a favourable one to build up the strength of the colonies and thus have a large force of field bees ready for the ensuing honey season. The following manipulations will, to a considerable extent, help the natural increase of the population. Weak colonies can be united and built up into strong ones or the population of a strong and weak colony can be equalised by interchanging the positions of the hives when the bees are working briskly. Old queens may be discarded and young ones introduced in their place. If conditions are favourable, drone breeding, construction of queen cells and the subsequent issue of swarms may occur. Necessary steps should be taken to prevent these. Colonies in good working condition may require supers.

M. C. Cherian and S. Ramachandran.

Crop and Trade Reports

Cotton, Raw, in the Madras Province The receipts of loose cotton at presses and spinning mills in the Madras Province from 1st February to 24th September 1943 amounted to 3,38,551 bales of 400 lb. lint as against an estimate of 4,06,300 bales of the total crop of 1942-43. The receipts in the corresponding period of the previous year were 578,184 bales. A total quantity of 497,996 bales mainly of pressed cotton was received at spinning mills and 839 bales were exported by sea while 199,451 bales were imported by sea mainly from Karachi and Bombay.

(*From the Director of Agriculture, Madras.*)

Moffusil News and Notes

The Hospet Sugarcane Growers' Co-operative Union Limited, Hospet The Prize Distribution Day of the Hospet Sugarcane Growers' Co-operative Union Ltd. was held at the Municipal Office, Hospet, on the 7th September 1943. Mr. P. H. Rama Reddi, the Director of Agriculture, Madras presided. The Additional Joint Registrar of Co-operative Societies, Madras, the Sub-Collector, Hospet, and other District Officers, and a large number of *ryots* of Hospet and surrounding villages were present. Rao Sahib A. D. Thandu Mudaliar, the President of the Union, presented a report on the progress of the Union since its formation in 1938.

The prizes were in the form of agricultural implements such as improved ploughs, Madras Ridgers, etc., and were awarded to 41 members who grew the improved varieties of sugarcane and obtained the highest yields during the last five years. The Director of Agriculture in his concluding speech expressed his gratitude and pleasure in meeting such a concourse of *ryots*.

A small exhibition was also arranged on the occasion when important posters on Grow More Food were prominently displayed.

C. N. M.

College and Estate News

Students' Corner The College reopened on the 4th instant and almost all the students have joined their classes. On the 14th the students of B. Sc. Ag. class II were taken on a week's tour to Mettupalayam, Coonoor, Ootacamund and Nanjanad for the study of local agriculture and plantation crops.

Games *Cricket* The first match of the Rhondy shield tournament played on 4th September against Victoria College, Palghat ended in time-draw; Victoria College 226 for 6 (Srikant 102 not out; K. S. Alwa 3 for 34) Agricultural College 71 for 6 (R. Narasimham 33).

M. Sc. Degree We are glad to announce that Sri L. Venkataratnam, B. Sc. (Ag.) was awarded the M. Sc. degree by the Madras University for his thesis entitled "Growth features and rooting habits in Sathgudi oranges (*Citrus Sinsensis* L. Osbeck) as influenced by root-stocks, and in mangoes (*Mangifera indica* L.) as influenced by propagational methods".

OBITUARY

We regret to record the demise of Sri P. V. Hanumantha Rao, Asst. Agricultural Demonstrator, Virdachalam on 1—10—43, due to heart failure. His untimely death is deeply mourned by one and all of his colleagues. We convey our sympathies to the members of the bereaved family.

Departmental Notifications

Gazetted Service—Appointments

Sri T. S. Ramakrishna Ayyar and Sri C. S. Krishnaswami Ayyar, Assistants in Mycology are appointed to act as Assistant Mycologists with effect from 13-4-43 and 16—7—1943 respectively.

Postings

Sri M. P. Sankaran Nambiar on the expiry of his leave is reappointed to officiate as D. A. O. Sattur Vice Sri N. Subrahmanya Ayyar granted leave.

Sri S. Sitharama Pathrudu, D. A. O. Vizagapatam will hold full additional charge of the post of D. D. A. Northern Division, Guntur vice Sri T. Budhavidheya Rao Nayudu granted leave.

Leave

Sri N. Subramanya Ayyar, D. A. O. Sattur l. a. p. for 4 months from the date of relief.

Sri T. G. Anantharama Ayyar, D. A. O. Trichinopoly, l. a. p. for 1½ months from the date of relief.

Transfers and Postings

Name of officer	From	To
Janab Md. Fassuddin Sahib	Asst. in Cotton, Adoni	A. D. Nandigama
Sri Ch Venkatachalam	A. D. (on leave)	Special A. D. Chintapalli
„ R. Govindarama Ayyar	F. M. Pattukottai	Special A. D. Madras City
„ V. G Venkataramana Rao	A. D. Wallajah	Do.

,, S. Mahadeva Ayyar	A. D. Koilpatti	Special A. D. Trichinopoly Town
,, R. Alagiamanavalan	A. D. Punganur	Special A. D. Coimbatore Town
,, N. Sobhanadri	A. D. Tenali	Food Inspector, Tenali

Leave

Name of officer	Period of leave
Sri R. Shanmukasundaram, Asst. in charge of Fruit Stations, Mettupalayam	Earned leave for 30 days from the date of handing over charge
,, B. Shiva Rao, A. D. Tuni	Extension of l. a. p. on m. c. for 1 month and 17 days and on half average pay on m. c. for 2 months and 13 days from 29—8—43
,, K. Cherian Jacob, Asst. in Botany, Coimbatore	Extension of l. a. p. on m. c. for 2 months from 24—9—43
,, P. Seshadri Sarma Asst. in Dry Farming Developmental Research Scheme, Bellary	Extension of l. a. p. for 1 month from 1—9—43
,, S. Venkatraman, A. D. Nannilam	L. a. p. for 1½ months from 17—9—43.
,, M. Krishnaswamy, A. D. Dharmavaram	L. a. p. on m. c. for 4 months from 20—9—43
Janab Zainulabdeen Sahib, Asst. R. R. S. Buchireddipalam	Earned leave for 30 days from 5—10—43
Sri M. S. Purnalingam Pillai, Sub-Asst. Cotton Section, Coimbatore	L. a. p. for 3 months and 20 days from 5—10—43
,, C. Ekambaram, F. M. S. R. S. Gudiyattam	Earned leave for 45 days from 4—10—43
,, K. Kunhikrishnan Nambiar, Asst. in Millets, Coimbatore	L a. p. for 1 month and 17 days from 25—10—43
,, K. Venkataswami, Asst. in Millets, Coimbatore	Earned leave for 34 days from 18—10—43

The Madras Agricultural Journal

(ORGAN OF THE M. A. S. UNION)

Vol. XXXI NOVEMBER 1943 No. 11.

EDITORIAL

Food Supply The supply of food to the country has become the foremost problem of the day, confronting the people and the Government. The shortage is great in certain provinces and states as in the case of Bengal, Cochin and Travancore. Bengal, essentially a rice growing area, is experiencing a severe famine on a scale never known before. The causes of the shortage of food are many. The supply of rice from Burma was cut off by the occupation of the country by Japan. The failure of the monsoon in certain areas, the present restricted transport facilities, the profiteer, the hoarder, the black market, the influx of evacuee populations from other countries etc, have combinedly contributed to the present shortage. People hold varying views about the causes of the shortage and try to single out one or two factors as being primarily responsible for the state of affairs and suggest certain remedies. The suggestions are not flawless and considerable practical difficulties are bound to be encountered in giving effect to them. The suggestion to Grow More Food by utilising every inch of land and facilities available and thereby increase the larder of the country appears to be the only one that is non-controversial. It behoves every individual to apply himself to this, the supreme task of the hour. Before the war, England was producing only 34 per cent of her food requirements and depended upon imports for the balance. She is today producing 60 per cent of her requirements. This has been possible in an industrial country actively participating in war, where every ounce of energy has to be spent in producing arms and ammunitions and for protecting the country. That food is as much a war material as anything else has been clearly recognised. Wastelands, lawns, public parks and pastures have been ploughed, and grains, vegetables and fodder grown on them in addition to augmenting the production of milk, bacon, beef, eggs, poultry etc. This should be possible in this country also, where people could apply themselves to their work undisturbed—a noble work viz. of providing food for the hungry.

The Madras Government are alive to the need for increasing production of food and are forging ahead. Large quantities of improved seeds are being produced in seedfarms distributed all over the presidency. Manures, especially oil cakes, are purchased and made available to the

poor *ryots* at the various agricultural depots. Considerable sums have been set apart for granting *thakkavi* loans to *ryots* for carrying on cultivation and for effecting land improvements. The development of irrigation has been taken up in earnest A special grant of one lakh of rupees has been set apart for each of the districts—Chittoor and the Ceded Districts, for developing well-irrigation. A large number of major and minor irrigation schemes costing over Rs 3 crores have been sanctioned and are being put through. All these, we presume would be continued even during the post-war period, to permanently benefit the country.

We are however aware that the primary agricultural producer has never had a square deal in the past and any extra price that he gets for his produce is all reasonable within limits. His labour is the most strenuous and he sustains as it were everybody else and yet his wages have been the lowest, when compared to his compeer in other walks of life. This disparity should disappear but by over-emphasising this sentiment, he should not be beguiled into exploiting others. The war has let loose relentless wolves on society and the process of making easy money regardless of its effects on human life, on human suffering and on the poor has become too common and exacting in the extreme. Racketeering, hoarding and profiteering are stalking the world leading to utter depravity and loss of human touch and the primary producer is also in danger of falling and succumbing to these temptations. Historians and sociologists will record that this war has been disastrous, not so much for destroying material goods, devastating countries, laying them waste and mercilessly exterminating countless millions of innocent lives, though these have had no parellel, as in destroying humanity itself We shudder to think of it and wish that the primary producer who depends largely upon Nature's gift at least, is not drawn into this whirlpool of depraved Humanity and may be left untainted.

D. Sc. to Rao Bahadur B Viswanatha We are glad to note that the Andhra University has decided to confer the honarary degree of 'Doctor of Science' on Rao Bahadur B Viswanath, C I E, Director of the Imperial Institute of Agriculture, New Delhi, in fitting recognition of his fruitful and meritorious services in the field of agricultural Chemistry. Mr. Viswanath is one of the founders of the Madras Agricultural Students' Union and the Union is mighty proud of this distinction on one of her founders.

Viceroy of India His Excellency Lord Linlithgow, the Viceroy of India, laid down the reins of office after seven years of eventful service. From the time he led the Royal Commission on Agriculture in 1926, he has been evincing a keen interest in agriculture and livestock. The All India Cattle Show inaugurated by him has come to stay as a permanent feature of the country. We wish him a well-earned rest. We extend our welcome to his successor, His Excellency Viscount Wavell, who has so soon shown himself to be a man of action and on whom India may depend for her advancement.

A Review of the Manurial Experiments on the Agricultural Crops of the Madras Presidency for the Decennial Period 1930-40

By The Paddy Specialist and Govt. Agricultural Chemist, Coimbatore.

Introduction At the instance of the Imperial Council of Agricultural Research, a committee was constituted as early as 1930 to investigate the problems relating to the development and consideration of manurial resources and to launch a programme of research on artificial and organic fertilisers to suit the needs of crops grown in several parts of India. The committee at its meeting held in June 1930, deemed it necessary to have sufficient information on the results of the manurial experiments conducted throughout India, and consequently arranged with the Provincial Departments of Agriculture to collect necessary data and collate them for a review and to chalk out a programme later on, on the basis of the results achieved. The Government of Madras with the financial aid from the Imperial Council of Agricultural Research arranged to collect and compile the results of the manurial experiments of the province, from the inception of the Department of Agriculture, up to 1930. The report comprising as it does, the results of nearly quarter of a century, has given valuable information regarding the performance and utility of a good many indigenous manures and artificial fertilisers in regard to important crops of this province.

In earlier years most of the experiments were conducted according to the then prevailing technique for field experiments, either without suitable number of replications or in single plots all continuously extending over a number of years. The defect has since been rectified during the last decade after the compilation of the review referred to above with the result that more systematic experiments came to be conducted in all the agricultural research stations of this Presidency based on modern field technique, in accordance with the advice tendered by the Imperial Council of Agricultural Research, to enable strict and correct statistical interpretation of the results. The findings of the later experiments covering a period of ten years, 1930-40, were collated as desired by the local Research Council to assess their merits and to suggest fresh schemes of research on manures with suitable modifications. These manurial trials have, in general, proved to be of greater value than the earlier ones, and afforded information on the relative merits of the several manures, especially nitrogenous and phosphatic (organic as well as inorganic), on the major crops, viz., paddy, sugarcane, *cholam*, etc. The results achieved during this period may be said to have passed the stage of experimentation and to be fit for general adoption in the several tracts of the province.

In the present review an attempt has been made to set forth the results in a popular form for the guidance and adoption by the *ryots*, the general

aim being to furnish information regarding soil deficiency and the manurial requirements of the crops grown in any particular tract of this province.

Soils The soils of the Agricultural Research Stations in this province may be broadly classified as follows:—

1. The deltaic areas of the Circars, represented by the Samalkot and Maruteru stations, consist of deep fairly fertile clay. The tracts round about the Anakapalle farm which consist of light red loams are deficient in nitrogen and phosphoric acid. The general rotations adopted are double or single crop paddy followed by garden crops of short duration. Very often sugarcane is also grown both under swamp and semi-wet conditions in rotation with paddy.

2. South of Madras, in the district of South Arcot, the tract represented by Palur Agricultural Research Station, is typical of a strip of alluvial soil lying between the Pennar and the Gadilam rivers and is fairly rich in all essential plant foods except nitrogen. Major portions of this area are irrigated partially by channels from the Gadilam, while the dry lands are commanded by wells. Paddy and sugarcane are the chief crops grown under wet conditions. Groundnut forming the main crop of the dry land is cultivated in rotation with occasional cereals like *varagu* or *ragi* under irrigation.

3. The Tanjore delta represented by the Aduthurai Farm is generally deficient in nitrogen and phosphates but well supplied with potash. The main crop of the locality is paddy, single or double, usually with no rotation except for the occasional raising of pulse crops such as green or black gram succeeding paddy.

4. The black cotton soil area, mostly unirrigated, is represented by Guntur, Hagari and Nandyal in the north and Koilpatti in the south of the presidency. The prominent crop of these areas is cotton which is grown with different rotations common to the respective tracts. The soils of Guntur and Nandyal Stations are well supplied with essential elements of plant food including lime; while those of Hagari and Koilpatti are particularly deficient in nitrogen. The rotations followed in the above stations are, (i) in Guntur, cotton followed by *jonna* (sorghum) or chillies, tobacco followed by *sajja, variga,* groundnut, maize or dry paddy, (ii) in Hagari, sorghum mixed with Bengal gram followed by a mixture of Italian millet and cotton, (iii) in Nandyal, sorghum is cultivated with green gram, and (iv) in Koilpatti, cotton followed by fodder sorghum or *cumbu.*

5. Coming to the central districts represented by the Coimbatore Central Farm, two different soils, red and black, are quite common. The black soils are deficient in potash and phosphoric acid and the red soils rich in all the essential elements of plant food. The general rotations practised in the farm are paddy after paddy (canal irrigated), *ragi,* wheat or sorghum (well irrigated), and dry crops—sorghum, Bengal gram, cotton, etc.

6. The West Coast soils, represented by the Pattambi, Kasaragod and Taliparamba stations ranging from sandy to heavy loams of laterite origin, are generally deficient in lime and phosphoric acid. Paddy is the main crop grown under rain-fed conditions at Pattambi, coconut in Kasaragod and spices, like pepper, at Taliparamba.

7. The clayey soils of the Nilgiris, represented by the Nanjanad Farm are also lateritic in origin very deficient in lime and phosphoric acid, besides being extremely acidic. The chief crop is potato, but *korali* and *samai* are grown in rotation and lupin cultivated as green manure crop.

It is also evident from the soil surveys so far conducted in this presidency that there is a general deficiency of organic matter, nitrogen and phosphoric acid in most of the cultivated areas.

The results of the manurial experiments during the decade have been classified according to the nature of the manures used in relation to different crops.

I. Inorganic fertilisers - (a) Nitrogenous and (b) Phosphatic manures

II. Organic Manures (a) Bulky manures e. g, green manures, composts, farm yard manure, green leaves, molasses, etc., and (b) Concentrated manures e. g., oil cakes—groundnut, neem, castor, etc.

Special attention has been devoted to the study of the performance of organic and inorganic manures when applied individually and in combination to the various crops with reference to the tracts already discussed.

The general findings of the present review reveal that the most efficient manures are green manures with or without phosphate for paddy, oil cakes for sugarcane and cattle manure for garden and dry land crops. The value of artificial fertilisers, except in the case of paddy and potato, are only of secondary importance. The behaviour of nitrogenous fertilisers by themselves has not been very satisfactory in most cases. In combination with organic manures either bulky or concentrated, the response of these artificial fertilisers have been found to be beneficial. This stresses the need for an adequate supply of organic matter in the soil for an efficient performance of the artificials. Superphosphate and bone meal are really useful to make up the phosphorus deficiency of soils and this has been confirmed by recent experiments. In combination with organic and nitrogenous manures super responds better and is invariably superior to bonemeal; but when supplied alone its response on crop growth is rather slow. The necessity for potassic fertilisers does not arise in this province as most of the soils are well supplied with this element to meet the normal requirements of staple food crops except perhaps in the case of crops like plantain and potato.

For the sake of convenience the results are discussed according to crops with reference to their behaviour to different types of manures applied, individually and in combination.

Paddy A good number of manurial experiments on this crop has been conducted in the agricultural research stations at Samalkot, Maruteru, Anakapalle, Aduthurai, Coimbatore and Pattambi, and these relate mainly to the study of nitrogenous and phosphatic manures.

(i) *Nitrogenous manures* It is a well established fact that the rice plant responds well to nitrogen in the form of ammonium sulphate, oil cakes or green manures. The beneficial effect of this plant food on the paddy crop in this province is quite striking as it may be evident from the results furnished in Table I for the different types of simple nitrogenous manures.

TABLE I Manurial experiments on paddy (i) Simple nitrogenous manures

Station	Treatment	Rate per acre in lb.	Available nitrogen in lb.	Normal yield per acre in lb.	Duration of the experiment in years	Percentage increase over control	Remarks
1. *Maruteru*	Ammonium sulphate	100	20	2,000	2	25	(1st crop)
	,,	do.	do.	1,500	3	28	(2nd crop)
	Oil cake—groundnut	225	16	1,500	3	23	,,
	,,	450	32	do.	3	38	,,
	,,	675	48	do.	3	51	,,
	Green manure	2,000	13	do.	3	15	,,
		4,000	26	do.	3	37	,,
	Green manure—both crops	2,000	13	do.	2	7	(1st crop)
						18	(2nd crop)
		4,000	26	do.	2	14	(1st crop)
						34	(2nd crop)
2. *Samalkota*	Ammonium sulphate	150	30	3,000	3	12	(1st crop)
	,,	do.	45	,,	3	18	,,
	Green manure	4,500	30	do.	4	12	(1st crop)
						27	(2nd crop)
	,, ,,	6,750	45	2,000	1	18	(1st crop)
						35	(2nd crop)
	,, ,,	4,000	27	3,500	3	9	(1st crop)
	,, ,,	6,000	40	do.	3	13	,,
3. *Anakapalle*	Green manure	3,000	20	2,300	11	12	
	,, ,,	4,000	26	1,800	2	21	
	,, ,,	6,000	39	do.	2	44	
	,, ,,	8,000	52	do.	2	51	
4. *Aduthurai*	Ammonium sulphate	100	20	2,500	3	12	(1st crop)
	,,	100	20	1,700	4	21	(2nd crop)
	,,	150	30	2,500	3	25	(1st crop)
	,,	150	30	1,700	4	34	(2nd crop)
	Nitrate of soda	200	30	2,500	2	12	(1st crop)
	Green manure	4,000	26	do.	4	9	,,

5. *Coimbatore—* *Paddy Breeding Station*	Ammonium sulphate	150	30	3,300	3	27	
	Nitrate of soda	200	30	2,100	1	7	
	Groundnut cake	750	30	2,400	3	20	
	Castor cake	750	30	do.	3	17	
	Green manure	4,500	30	do.	3	14	
	,, ,,	6,000	45	do.	3	17	
6. *Pattambi*	Ammonium sulphate	150	30	1,300	4	42	(1st crop)
	,,	150	30	1,700	4	34	(2nd crop)
	Nitrate of soda	200	30	1,300	1	17	(1st crop)
	Groundnut cake	212	15	1,700	4	14	,,
	,, ,,	425	30		4	30	,,
		212	15	1,600	4	9	(2nd crop)
	,, ,,	425	30		4	28	,,
	Castor cake	660	30	1 500	3	26	,,
	Neem cake	500	30	do.	3	19	,,
	Green manure	4,000	27	do.	3	15	,,
	,, ,,	5,000	33	1,300	5	42	(1st crop)
	,, ,,	,,	33	1,600	5	41	(2nd crop)
	,, ,,	8,000	53	1,800	1	27	,,
	Cattle manure	5,000	30	1,300	5	19	(1st crop)
	,, ,,	5,000	30	1,600	5	14	(2nd crop)

These experiments while indicating the need for adequate supply of nitrogen have also thrown light on the best method of applying plant food; ammonium sulphate, green manures and oil cakes have been found to satisfy the requirements of this crop in all the agricultural stations. The normal dose of nitrogen lies somewhere about 30 lb. for a good return of the crop with percentage increases ranging from 25 to 40 depending upon the nature of manure, the locality and the strain. The optimum dose is to be fixed at 150 lb. for ammonium sulphate to supply 30 lb. nitrogen; while for groundnut cake the relative dose is 425 lb. It is of interest to record the most efficient response of ammonium sulphate resulting in an increase of 35 to 40 per cent with Pattambi soil of laterite origin, consistently over a period of four years. Green manure has been the universal bulky organic manure which has been tried with beneficial results on all the stations. Its application in varying doses, 2,000 to 8,000 lb. per acre, has increased the yields of first and second crops according to the quantity of the manure applied. The optimum dose for all the stations appears to be within the limits of 4,000 to 6,000 lb. the percentage increase in yields varying from 25 to 45. Maximum response (40 to 50%) was noticed with an application of 6,000 to 8,000 lb. in the case of the Circars and West Coast soils (with second crops), and 9 and 17 per cent respectively for the Cauvery Delta and Coimbatore soils.

Different kinds of oil cakes have been tried to supply 30 lb. of nitrogen in most of the stations and the increases in yields are 38 per cent for Maruteru, 20 per cent for Coimbatore and 30 per cent with groundnut

cake at Pattambi. Groundnut cake may be advocated for all the areas of the province to supply 30 lb. nitrogen per acre. In an experiment conducted at Maruteru with groundnut cake (on second crop) at varying levels of nitrogen (16 lb., 32 lb, 48 lb.) a progressive response was noticed with incremental doses with a record yield of 51 per cent over control for the 48 lb. nitrogen level.

Among the artificials, nitrate of soda has proved ineffective when compared with other nitrogenous manures tried in most of the stations. It is neither economical nor beneficial to use it as manure for the crop. The bulky organic manures viz., cattle manure, molasses and composts, have been tried for periods up to five years in a few stations (Aduthurai and Pattambi), with no appreciable increase in yields, except perhaps, with cattle manure to supply 30 lb. nitrogen at Pattambi, showing a rise in the average yield to the extent of 14 to 20 per oent.

(ii) *Combination of nitrogenous manures* Experience has shown that the combined application of organic and inorganic manures at Coimbatore has proved more beneficial than either of these applied alone. The effect is particularly marked in areas with a pronounced deficiency of nitrogen as at Pattambi and Maruteru (Table II).

TABLE II Manurial Experiments on paddy (ii) Combination of nitrogenous manures

Station	Treatment and rate of application per acre	Available nitrogen in lb.	Normal yield per acre in lb.	Duration of experiment in years	Average percentage increase over control	Remarks
1. *Maruteru*	Green leaf 2,000 lb. *plus* ammonium sulphate 80 lb.	28	1,500 (2nd crop)	3	40	Increase for leaf only 15%
	Green leaf 2,000 lb. *plus* ammonium sulphate 160 lb.	44	do.	3	44	
	Green leaf 2,000 lb. *plus* ammonium sulphate 240 lb.	60	do.	3	56	
2. *Aduthurai*	Ammonium sulphate 75 lb. *plus* nitrate of soda 100 lb.	30	2,500	2	22	Increases due to ammonium sulphate only and sodium nitrate only are 26 and 12% respectively
	Ammonium sulphate 100 lb. *plus* nitrate of soda 67 lb.	30	do.	2	20	
	Ammonium sulphate 50 lb. *plus* nitrate of soda 133 lb.	30	do.	2	21	
3. *Coimbatore Paddy Breeding Station*	Ammonium sulphate 75 lb. *plus* nitrate of soda 100 lb.	30	2,600	2	19	Increase due to individual application of the respective manures—ammonium sulphate, sodium nitrate, green leaf, are 26, 7 and 14%
	Ammonium sulphate 100 lb. *plus* nitrate of soda 67 lb.	30	do.	2	22	
	Ammonium sulphate 50 lb. *plus* nitrate of soda 133 lb.	30	do.	2	11	
	Green leaf 2,000 lb. *plus* ammonium sulphate 100 lb.	32	3,000	2	10	
	Green leaf 2,000 lb. *plus* ammonium sulphate 200 lb.	52	do.	2	17	
	Green leaf 2,000 lb. *plus* ammonium sulphate 400 lb.	92	do.	2	31	

4. *Pattambi*	Ammonium sulphate 75 lb. *plus* nitrate of soda 100 lb.	30	1,200	1	26	Increases due to single manures (i) ammonium sulphate 32% (ii) sodium nitrate 17% (iii) Cattle manure 1·3% (iv) Castor cake 26% (v) Neem cake 19%
	Ammonium sulphate 100 lb. *plus* nitrate of soda 67 lb.	30	do.	1	27	
	Ammonium sulphate 50 lb. *plus* nitrate of soda 133 lb.	30	do.	1	27	
	Green leaf 4.500 lb. *plus* ammonium sulphate 75 lb.	45	1,460	3	60	
	Green leaf 2,500 lb. *plus* groundnut cake 212 lb.	30	1,600	4	19	
	Cattle manure 2,500 lb. *plus* groundnut cake 212 lb.	30	do.	4	21	
	Castor cake 750 lb. *plus* ammonium sulphate 75 lb.	45	1,460	3	59	
	Groundnut cake 425 lb *plus* ammonium sulphate 75 lb.	45	do.	3	63	
	Neem cake 500 lb. *plus* ammonium sulphate 75 lb.	45	do.	3	55	

Experiments conducted with a combination of simple artificials like ammonium sulphate and nitrate of soda to supply 30 lb. nitrogen in varying proportions at Aduthurai, Coimbatore and Pattambi have given only an increased yield of about 20 per cent over control, but in no case superior to that of ammonium sulphate applied individually. Considering the deleterious after effect of such a combination, particularly nitrate of soda, in the long run, it is not desirable to adopt this in practice.

However an application of ammonium sulphate (75 lb. or 15 lb. nitrogen) over a basal dressing of green leaf (2,000 lb.) has yielded 40 per cent over the control at Maruteru; while with the increased doses of the artificial supplying 16, 32, and 48 lb. nitrogen, the increases ranged between 40 to 56 per cent during a three year trial. A phenomenal increase of 60 per cent has been recorded at Pattambi consistently for a period of three years when nitrogen is applied at 15 lb. level as ammonium sulphate (75 lb.) in combination with green leaf at 4,500 lb. In conjunction with oil cakes more marked response has been observed in the same station for ammonium sulphate when the ratio of organic to inorganic nitrogen is 2 : 1, the total being 45 lb. nitrogen. The increased yield ranged between 55 to 63 per cent for the various combinations of ammonium sulphate with neem, castor and groundnut cakes with the second crop of paddy.

Thus it would appear that a judicious combination of organic and inorganic manures viz., green leaf at 4,500 lb. *plus* ammonium sulphate 75 lb. (15 lb. N.) or oil cake to supply 30 lb. nitrogen plus ammonium sulphate 75 lb. (15 lb. N.) is best suited for paddy crop. In no case a combination of artificials alone is to be resorted to for the soils of this presidency under paddy to supplement their nitrogen requirements. An adequate supply of organics must be ensured to obtain maximum benefit with artificials.

(iii) *Phosphatic manures* Phosphate is an essential plant nutrient for the production of good quality grain; consequently, its application in adequate amounts to soils deficient in this constituent would appear to be necessary. Phosphatic manures like super, bone meal, bone jelly, Kossier

phosphate, etc. when applied individually at 30 lb. level of phosphoric acid in a few stations, viz, Coimbatore and Aduthurai, have not shown any appreciable increase in yield, the maximum ever met with being about 17 per cent over control at Coimbatore, whereas at Aduthurai the percentage increases have fluctuated between 5 and 11. The behaviour of these fertilisers by themselves towards paddy crop is rather erratic, and as such they cannot be safely recommended. Phosphatic manures in general respond better in combination with organic or inorganic nitrogenous manures, such as green leaf and ammonium sulphate (Table III).

TABLE III. Manurial experiments on paddy

(iii) Combination of nitrogenous and phosphatic manures

Station	Treatment and rate of application per acre	Available constituents in lb. Nitrogen	Available constituents in lb. Phosphoric acid	Normal yield per acre in lb.	Duration of experiment in years	Percentage increase over control	Remarks
1. *Samalkota*	Ammonium sulphate *plus* super phosphate						
	,, 150 lb. ,, 167 lb.	30	30	1,900	4	26	Increase for 30 and 45 lb. N. as am. sulphate - 12% & 18%
	,, 225 lb. ,, 167 lb.	45	30	3,000	2	27	
	,, 150 lb. ,, bone meal 136 lb.	30	30	do.	2	14	
	,, 225 lb. ,, ,,	45	30	do.	2	21	
	Niciphos	30	30	1,900	4	29	
	Green leaf 4,500 lb. ,, super-phosphate 167 lb.	30	30	do. (2nd crop)	4	31	
	,, 6,750 lb. ,, ,,	45	30	2,000 (2nd crop)	1	38	Green leaf - 45 lb. N. gives 35% increase
	,, 4,500 lb. ,, bone meal 136 lb.	30	30	do.	1	24	
	,, 6,750 lb. ,, ,, ,,	45	30	do.	1	28	
	,, 2,250 lb. ,, ammonium sulphate 75 lb. *plus* super 167 lb.	30	30	1,900	4	33	

Note. **Absence of response to super in combination with green leaf on this station is evidently due to the presence of this constituent in the soil above the normal limit. (cf. Table I for green leaf only).**

Station	Treatment and rate of application per acre	Nitrogen	Phosphoric acid	Normal yield per acre in lb.	Duration of experiment in years	Percent increase over— No manure	Percent increase over— Leaf
2. *Maruteru*	Green leaf 2,000 lb. *plus* super phosphate 178 lb.	12	32	1.400	3	25	18
	,, ,, ,, niciphos	28	16	1,500	2	38	18
	,, ,, ,, ,,	44	32	do.	2	58	
	,, ,, ,, ,,	60	48	do.	2	54	

	Groundnut cake 212 lb. plus flour phosphate 178 lb.	16	16	do.	3	17	23
	„ 425 lb. „ „	32	32	do.	3	36	38
	„ 637 lb. „ „	48	48	do.	3	55	51
	„ 212 lb. „ milled guano	16	16	do.	3	18	23
	„ 425 lb. „ „	32	32	do.	3	41	38
2. *Maruteru*	Green leaf 2 000 lb. *plus* am. sulph. 80 lb. *plus* superphosphate 90 lb.	28	16	do.	3	33	39
	Green leaf 2,000 lb. *plus* am. sulph. 160 lb. *plus* superphosphate 180 lb.	44	32	do.	3	56	44
						Increase over no manure	
	Green leaf 2,000 lb. *plus* am. sulph. 240 lb, *plus* superphosphate 270 lb.	60	48	1,500	3	54	
	Green leaf 2,000 lb. *plus* am. sulph. 40 lb. *plus* niciphos	36	16	do.	3	47	
	Green leaf 2,000 lb. *plus* am. sulph. 80 lb. *plus* niciphos	44	16	do.	3	49	

							Increase due to N	Increase due to N+P_2O_5	
3. *Aduthurai*	Ammonium sulphate	*plus* conc. super							
	100 lb.	50 lb.	20	20	2,500	4	11	26	(1st crop)
	„	„	20	20	1,700	4	21	26	(2nd crop)
	150 lb.	75 lb.	30	30	2,500	4	25	37	(1st crop)
	„	„	30	30	1,700	4	34	36	(2nd crop)
	„	50 lb.	30	20	2,500	4	25	37	(1st crop)
	„	„	30	20	1,700	4	34	36	(2nd crop)
	100 lb.	75 lb.	20	30	2,500	4	11	38	(1st crop)
	„	„	20	30	1,700	4	21	31	(2nd crop)
	Ammonium sulphate	*plus* bone meal							
	100 lb.	180 lb.	27	40	1,800	3	7		
	Green leaf 2000 lb.	*plus* superphosphate 112 lb.	12	20	2,100	1	25		
	Green leaf 4000 lb.	*plus* bone meal 200 lb.	31	40	1,800	3	7		
	„	„ Bone jelly	31	40	do.	3	7		
	Green leaf 2,000 lb. *plus* am. sulphate 150 lb. *plus* super 150 lb.		42	30	2,000	1	20		
	Green leaf 4,000 lb. *plus* am. sulphate 65 lb. *plus* bone meal 180 lb.		44	40	1,800	3	16		

4 *Coimbatore–Paddy Breeding Station*							Increase due to green manure
	Green leaf 4,000 lb. *plus* superphosphate 112 lb.	24	30	3,000	2	19	10

5. *Pattambi*						Leaf alone
Green leaf 4,000 lb. *plus* bone meal 168 lb.	31	30	1,800	3	21	17
Green leaf 4,000 lb. *plus* superphosphate 112 lb.	24	30	1,700	3	21	11
Green leaf 2,000 lb. *plus* am. sulph. 150 lb. *plus* super 112 lb.	42	30	1,500	4	12	(1st crop)
Green leaf 2,000 lb. *plus* am. sulph. 150 lb. *plus* super 112 lb.	42	30	1 800	4	15	(2nd crop)
Green leaf 4,000 lb. *plus* ammophos	42	30	1,750	3	23	
Green leaf 2,000 lb. *plus* am. sulph. 125 lb. *plus* kossier phosphate	37	45	1 800	1	13	
Green leaf 2,000 lb. *plus* am. sulph. 125 lb *plus* steamed bone meal	37	45	1,800	1	15	

Experiments with a mixture of nitrogenous fertilisers like ammonium sulphate and super to supply varying amounts of nitrogen and phosphoric acid at Samalkot and Aduthurai have shown increased yields of 26 and 36 per cent respectively. A combination of bone meal and ammonium sulphate under similar circumstances has proved ineffective in increasing the yields. The rise in the several cases ranges from 7 to 14 per cent only.

Phosphates, preferably super, in combination with organics like green manure and oil cakes have responded better than when applied alone. With incremental dosages of green manures in the presence of a constant amount of phosphoric acid, the yield is enhanced. Experiments with a constant level of phosphoric acid (30 lb.) and varying amounts of green manure or with a basal dose of the same at 2,000 lb. have given increased yields in most of the stations from 20 to 38 per cent over control. Between bone meal and super it is advantageous to apply the latter along with green manure or any other organic nitrogenous manure.

With regard to niciphos which is in itself a nitrogenous and phosphatic fertiliser, a rise of 30 per cent over control has been recorded at Samalkot when applied to provide 30 lb each of nitrogen and phosphoric acid. Its combination with green leaf at 2,000 lb. to supply 16, 32 and 48 lb. of nitrogen and phosphoric acid has resulted in a maximum increase of 58 per cent for the 32 lb. combination at Maruteru during a two year trial.

The other miscellaneous phosphates such as flour phosphate and milled guano have also been tried for over three years at Maruteru in combination with oil cakes to supply 16, 32 and 48 lb nitrogen and corresponding amounts of phosphoric acid. Both the manures have behaved alike and the increases are progressive with the additional dosages of phosphoric acid. The maximum yield of 55 per cent has been observed for flour phosphate (537 lb) supplying 48 lb. phosphoric acid;

whereas a rise of 41 per cent. is noticed for 425 lb. milled guano (32 lb. phosphoric acid).

Further experiments with different types of phosphates, viz, super, niciphos, ammophos, bone meal, kossier phosphate, etc. in combination with green leaf and ammonium sulphate have also given striking increase in yields except at Pattambi and Aduthurai, wherein the results are comparatively lower than for a simple combination of super with green leaf or ammonium sulphate.

These experiments in general go to show that more beneficial application of phosphoric acid is when it is done along with suitable nitrogenous manures like green leaf, cakes or a combination of both.

The trials on the combination of nitrogenous and phosphatic manures, e. g. green manure *plus* super or cake *plus* super in varying doses, have not increased the yields appreciably, when compared to the performance of nitrogenous manures by themselves. This does not however minimise the importance of phosphate application to soils of this presidency which are likely to be depleted further of this plant food by continuous cropping. For the maintenance of normal crop production it is absolutely necessary to resort to periodical addition of phosphates preferably in conjunction with bulky organic manures like green manure and oil cake, though appreciable increases have not been recorded for its addition in the experiments so far reviewed.

The time of application Experiments have been in progress at most of the stations to find out the best time of application of manures to paddy, especially nitrogen and phosphate, either alone or in combination with green leaf in varying doses. The time of application varied from the commencement of planting up to flowering stage. The results of the trials indicate in general no beneficial effect due to the variation in the period of application beyond a month after planting.

At Coimbatore the application of 30 lb. nitrogen as ammonium sulphate split up into single, double and triple doses, at planting or 3, 6 and 9 week intervals has not affected the yields in any way except for 9 week period, wherein an increased yield of 30 per cent (as against 26 per cent at planting) has been recorded over the normal of 3,400 lb. In other treatments the increase in yield is about 20 per cent over the average.

At Maruteru also the application of green manure (basal 2,000 lb.) and ammonium sulphate (32 lb. nitrogen) at planting has increased the yield of paddy by 44 per cent over control. When the dose is split up and applied in equal parts one at planting and the other 30 days later the percentage increase has gone up to 61. In another experiment at Coimbatore wherein varying doses of ammonium sulphate at 20, 40 and 80 lb. nitrogen levels were applied over a basal dressing of green leaf, no difference was observed in crop yields due to the splitting of the dosages and their application at different periods. (Table IV). However there is a progressive increase in

yield with higher levels of nitrogen and the time of application would appear to have no special advantage on the paddy crop under Coimbatore conditions.

TABLE IV Time of application of manures experiment *(Ammonium sulphate)*

Station	Treatment	Time of application	Duration in years	Percent increase over control
Coimbatore Paddy Breeding Station	Green leaf 2,000 lb. (basal dressing) *plus* ammonium sulphate at varying levels of nitrogen from 20 to 80 lb.	(a) 20 lb. nitrogen in single and divided doses 10, 5 and 2½ lb. at intervals—10 to 45 days	2	10 to 12
		(b) 40 lb. nitrogen in single and divided doses 20, 10 and 5 lb. at intervals—10 to 45 days	2	17 to 20
		(c) 80 lb. nitrogen in single and divided doses 40, 20 and 10 lb. at intervals—10 to 45 days	2	30 to 40
		Normal yield—3,000 lb. per acre		

At Pattambi the application of ammonium sulphate to supply 30 lb. nitrogen distributed in single and double doses over a basal dressing of green leaf (2,000 lb.) and super (1 cwt.) at varying intervals has resulted in an increase of 27 to 28 per cent for a single dose addition, one month after planting, as compared to 15 per cent at planting. The incorporation of the manure at other intervals either in single or divided doses has not been so effective as the previous one (*vide* Table V). In a single experiment at Aduthurai and Maruteru an increase of 57 per cent has been recorded for a similar application of ammonium sulphate during a three year trial.

TABLE V Time of application of artificials *(Ammonium sulphate)* at Pattambi

Treatment	Time of application	Duration in years	Percentage over control 1st crop	2nd crop
Green leaf 2,000 lb. super to supply 30 lb. phosphoric acid and ammonium sulphate at 30 lb. nitrogen applied in varying doses at different intervals	(A) Single dose			
	(i) At planting	3	12	15
	(ii) One month after planting	3	27	28
	(iii) Two months after planting	3	13	17
	(B) In two doses			
	(i) 15 lb. nitrogen at planting *plus* 15 lb. one month after planting	3	21	20
	(ii) 15 lb. nitrogen at planting *plus* 15 lb. two months after planting	3	17	26
	(C) In three doses—10 lb. at planting *plus* 10 lb. one month after planting *plus* 10 lb. two months later	3	16	27
	Normal yield—1st crop 1,500 lb., 2nd crop 1,700 lb. per acre			

It is evident from these trials that the addition of ammonium sulphate in a single dose (150 lb.) one month after planting either alone, or with a

basal dressing of green leaf, or green leaf *plus* super is the best of all the treatments for getting the maximum yield of the crop.

As for the time of application of super it is observed from the experiments at Coimbatore that its addition in a single dose at 30 lb. phosphoric acid or in combination with green leaf at the time of planting has responded better giving a maximum rise in yield of 17 per cent over control (2,400 lb.) when compared to the yields of other periods which are quite negligible. In another experiment wherein the reaction of super (30 lb. phosphoric acid) added at the time of planting with green leaf (6,000 lb.) applied simultaneously and at 10 and 20 days before planting, was studied, it was noticed that interaction between the manures was not felt to an appreciable extent for any of the periods of decomposition of green leaf. The percentage increases for the three different periods of decompsition are more or less alike lying between 30 and 35 per cent over control; while super alone applied at the time of planting has yielded 7 per cent more.

Residual effect Experience on the manuring of paddy has revealed the absence of any residual effect of nitrogenous manures of any type in particular on the succeeding crop. This emphasises the need for renewed application of these manures every time the crop is raised.

(To be continued)

Commercial Cane Sugar Value and its Importance

By W. THIRUMALA RAO, B. Sc. (Ag.)

and

K. SRIRAMAN, B. Sc. (Ag.),

Agricultural Research Station, Anakapalle.

Commercial cane sugar value Sugarcane consists mainly of juice and fibre. Of the constituents of the juice, sucrose forms the major part. The sugar that we daily use, is mainly sucrose. It is not all the sucrose of the sugarcane juice that can be bagged for use. A fraction of it goes to waste. The maximum amount of sugar that can be manufactured from a cane of known analysis is called the "commercial cane sugar value" (C. C. S.), or the "available sugar". This recovery of sugar depends upon (1) the efficiency of the machinery, (2) the skill of the factory superintendent, (3) nature of the cane, and (4) the quality of the juice. Of these, the quality of the juice is the most important factor. The sugar is manufactured in the field by the cane and the processes in the factory are only of secondary importance. Taking the quality of the juice alone into consideration, it is found that the "available sugar" varies with factors like (1) the fibre content of the cane, (2) the total amount of sucrose present, and (3) the proportion of sucrose to that of the soluble matter in the juice. After long research and experience, formulae have been evolved to forecast the amount of sugar that can be manufactured under efficient conditions with a

given variety of cane. Of these the one recommended by R. Srivatsava is both simple and reliable for Indian conditions. The formula is :—

$$C.\,C.\,S. = \frac{3P}{2}\left(1 - \frac{10+F}{100}\right) - \frac{B}{2}\left(1 - \frac{6+F}{100}\right)$$

where P=polarisation of juice, B = corrected brix of the juice, and F=% fibre content in cane.

Its application Of the numerous varieties of sugarcane grown in the different parts of the country the choice of the best variety for a particular locality is beset with many difficulties both for the breeder and the actual grower. It is well-known that the growth and hence the tonnage as well as the composition of the juice of the different varieties of cane are influenced by the soil, climate and treatment. The farmer naturally would prefer to grow a cane which yields a high tonnage, whereas the factory people would prefer canes that yield high sugar recoveries. Only very few varieties of cane evolved so far satisfy both these requirements. For instance, B. 208 has got a high C. C S. value of 14 % nearly, whereas the yield is only about 25 tons per acre. J. 247 and Co. 213 yield more than 35 tons per acre, but the C. C. S. value is below 10 % under Anakapalle conditions. Under the present conditions of shortage of food grains when the "grow more food" campaign is being carried on vigorously and extensively, a cultivator would set apart only a limited portion of his land for the cultivation of sugarcane and hence to satisfy the requirement of the country for sugar it is very necessary to grow varieties which combine in them tonnage with high sugar content. That is not all. The duration of the season for crushing is another important factor, to reckon with; the longer the crushing period, the less will be the cost of production of sugar and hence more beneficial. The selection of a number of varieties which come to maturity at different periods, thereby assuring material to keep the factories going for at least four months, and possess a high C. C. S. value should be the aim of the cane breeder. As the monthly determination of the C. C. S. values of the varieties that are grown at the Anakapalle station will be of help in the selection of suitable types, this investigation was undertaken.

Materials and results Important varieties of sugarcane grown on the Agricultural Research Station, Anakapalle, have been analysed for their C. C. S. value and the results of some of them are presented in Table I. The yield records also have been noted side by side. Though data for a continuous period of three years, for each of the varieties of cane, have been gathered, the data for one particular year alone have been presented as they are representative of the other two.

Discussion The actual recovery of sugar in most of the factories in India, is between 8 to 10% only. Table I shows 12 to 13% as recoverable sugar, which may seem to be rather high. The results presented are those obtained from quality canes grown under improved methods of cultivation and manuring in an agricultural research station located in a fertile area

and naturally the quality of the juice is good and the C. C. S. values are high. The factories may not be able to secure such good quality cane for crushing on a large scale and therefore the C. C. S. values obtained at this station may be beyond the reach of factories at present. But if the canes are assessed on their C. C. S. values and the price paid is related to these values, then the quality canes are bound to spread quicker and simultaneously also the methods of cultivation practised improve. Such encouragement given to the growers will ultimately raise the C. C. S status of canes of India as a whole which is, at present, much lower than that of Java and Queensland.

TABLE I Commercial Cane Sugar value

Variety of Sugarcane	Yield in tons per acre	Commercial cane sugar value—per cent								
		October	November	December	January	February	March	April	May	June
Co. 213	38	1·30	5·65	8·96	9·68	9·67	9·68	7·72	6·17	4·50
Co. 312	47	...	6 94	7·58	9 63	10·32	10·90	9·17	...	...
Co. 313	33	6 87	10 24	12·19	12·39	11·43	10 76	9·23	7·29	5·61
Co. 419	55	5 54	8 33	9 97	10·63	12·26	12·42	10·95	9·84	9·19
Co. 421	42	5·66	9·22	10·93	12·27	11 69	10·35	10·26	9·12	7·88
Co. 443	42	...	8 82	10·18	11·93	12·76	12·35	11 60	...	...
Co. 508	37	8 70	10·73	12 96	12 68	13·70	12·95	13·35	12·17	9·81
Co. 523	42	...	9·37	10·03	11·02	11·38	11 30	11·20	...	...
Co. 527	43	...	8 46	10·96	12 07	12 45	12 12	12·14	...	...
Poj. 2878	34	6 11	9·72	13 12	12 59	14 05	11 34	11·36	6·51	7·56

The season is from March to March normally. C. C. S. values above 10% is considered desirable from the point of view of factory.

"Commercial cane sugar values" alone do not determine the choice of varieties. The amount of sugar that can be manufactured from an acre of land, and the capacity of the cane to maintain this value for at least four months has also to be considered and should be the criteria in the selection of varieties for a locality. The figures given in Table II below, represent the approximate amount of sugar that can be manufactured from an acre of sugarcane crop.

TABLE II Approximate amount of Available sugar—tons per acre

$$\frac{\text{C. C. S. \%} \times \text{Yield}}{100}$$

Variety	November	December	January	February	March	April	May
Co. 213	2·2	3·4	3·7	3·7	3·7	2·9	...
Co. 312	3·3	3·6	4·5	4 9	5·1	4·3	...
Co. 313	3·4	4·0	4·1	3·8	3·6	3·1	...
Co. 419*	4 6	5·5	5·9	6·7	6·8	6·0	5·4
Co. 421	3·9	4·6	5·2	4·9	4·4	4·3	...
Co. 443*	3·7	4·3	5 0	5·4	5·2	4 9	...
Co. 508*	4 0	4·8	4 7	5·1	4 8	4·9	4 5
Co. 523	3·9	4·2	4·6	4·8	4·8	4·7	...
Co. 527*	3·6	4·7	5·2	5 4	5·2	5·2	...
Poj. 2878	3·3	4·5	4·3	4·8	3·9	3·9	...

It will be seen from Table II above that (1) varieties like P. O. J. 2878 and Co. 313, though rich in C. C. S. value do not give high yields of sugar per acre, because of their low tonnage, (2) some varieties like Co. 421, Co. 312, and Co 443 mature a little late as compared with varieties like Co. 527 and Co. 508, (3) the profitable nature of the cane (asterisks in Table II) lasts for a longer period in some varieties like Co. 419, Co. 508, Co. 527 and Co. 443, while it lasts only for a short time, as in Co. 421, Co. 312 and P. O. J. 2878. Taking all these factors into consideration, the factory can programme to crush for a period of at least four to five months, manufacturing the maximum amount of sugar from a minimum area, thereby profiting themselves and the farmer.

There is yet another use for the "commercial cane sugar value". It concerns the farmer, who manufactures jaggery out of the juice. The C. C. S. values have been found to indicate, within a difference of 1 %, the recovery of jaggery. With the aid of the C. C. S values the farmer can easily determine the best period for harvest and also estimate the amount of jaggery that can be obtained from the different varieties of cane.

Conclusions The ideal of manufacturing more sugar from a limited area, can be achieved only by choosing varieties of high C. C. S. value, tonnage and the duration of the profitable yield. The yield of sugar per acre is of great utility in deciding varieties of cane to be grown. By a careful and critical study of the figures month-war, the crushing period of the factory can easily be extended from four to five months at least. Under the Anakapalle conditions Co. 419, Co. 508, and Co. 527 seem to be most profitable to keep the factories going for about five months in the year and it is likely that the period can be prolonged by pursuing this investigation further for a search for early and late varieties that can be crushed with profit before December and after April.

This investigation, which is of a preliminary nature, indicates a method by which choice of canes may be made, under conditions obtaining round about Anakapalle, for supplying to the sugar factory spread over a period of about five months. It is also of great help to the jaggery manufacturer as the recovery of jaggery can be forecast with only a slight margin of difference. Similarly selection of varieties which satisfy the primary condition of profit to the cultivator as well as the manufacturer by permitting a continuous programme of crushing, well suited to the weather conditions of the tract and able to withstand the incidence of pests and diseases can be made in respect of other important cane growing tracts.

Acknowledgments Our thanks are due to the Government Agricultural Chemist, Coimbatore and the Superintendent, Agricultural Research Station, Anakapalle, for having given us the necessary guidance and facilities for pursuing this investigation.

The Mango shoot-webber—*Orthaga exvinacea* Hmpsn. and its control

By M. C. CHERIAN AND K. P. ANANTHANARAYANAN,
Agricultural Research Institute, Coimbatore.

Introduction Of the caterpillar pests affecting mango shoots, *Orthaga exvinacea* Hmpsn. a pyralid, is the most important. Little or no connected account of the pest exists excepting for scattered references made by Hampson (1896), Fletcher (1914) and Ramakrishna Ayyar (1932; 1940). A record of the observations on the pest made over a period of two years is presented in this paper.

Distribution and occurrence The insect is known to occur throughout the Madras Presidency and is recorded as a pest. At Coimbatore, it is fairly serious from February to October though it is sparsely evident at other periods.

Nature of damage The caterpillars destroy the foliage a great deal. A badly affected tree can be recognised even from a distance, by the presence of numerous clusters of webbed leaves. The leaves wither and dry up and are often found loosened from their stalks but held together by webs. The trees which bear such clusters of affected leaves, present a sickly appearance. The pest seems to have no special preference to any particular variety of mango. Young trees are subject to more severe attack than old ones.

Life history The female moth reared in captivity lays eggs in small clusters on the silken strands of the webs of attacked shoots. When laid on the leaf, they are laid singly near the ribs of the leaf. Thirty to fifty eggs are laid by a single moth in seven to nine clusters.

Egg The egg is yellowish green in colour, matching with the colour of ribs of leaves; when laid on leaf, it is oval and somewhat flat, but when in clusters, the eggs overlap and are glued in mass and the true shape of individual eggs is not revealed. In two to three days, the eggs take a pinkish colour owing to the transparent shell allowing the colour of the developing caterpillar to be seen. The eggs hatch in four days.

Larva The newly hatched caterpillar is pale greenish in colour with pale white head and blackish prothorax. The first abdominal segment has a clearly marked pink transverse band. The abdominal region as a whole has numerous light and irregular pinkish lines especially at the lateral region. The whole body is covered with isolated whitish hairs which are thin and fairly long, and arise from light dark warts on the body. The caterpillars in the young stages are gregarious and begin to feed on the foliage by scraping the green matter. They wriggle on hatching from the old webs and slowly reach the foliage nearby. Small patches of green

matter on leaves are gnawed, and soon a tunnel of thin webs is made, within which the caterpillars remain. While extending the area of attack on the leaf the extent of the tunnel of webs is also increased slowly. The caterpillar moults five to seven times and in captivity takes one month to go into the next pupal stage.

The full grown caterpillar measures about 3·5 cm. The head shield is brownish with dark motlings. Prothorax is as broad as head, pale with less dense markings. In the body, there are two dark bands, one longitudinal, and the other across the hind border of the prothorax. The mid-dorsal area is pale greenish white or light pale greenish. The setae are thin and inconspicuous but arise from clear black warts arranged in rows. The five pairs of prolegs are slender and pale white, with the crochets arranged in a circle The caterpillar is very active and always lives in tunnels of webs. In the grown-up stage, it makes holes in the leaf, and many a leaf in the webbed cluster is reduced to mere ribs. Only a single caterpillar or two are found in a webbed cluster. When disturbed from the folds of leaves it treads forwards or retreats backwards, and with a characteristic bending and wriggling of its body, skips off the leaf into the air and drops by a long silken thread which may be sometimes one to two yards long It suspends, itself dexterously on this strand which is produced to required length with marvellous rapidity, and the caterpillar uses it to climb back to the same web of leaves. The silken thread itself is very delicate, thin, inconspicuous and made visible only by the hanging caterpillar below. It takes an hour or more for the caterpillar to regain its normal position on the leaf. The grown-up caterpillar is a voracious feeder. It nibbles the edges or bites large holes, deserts old clusters and forms new ones binding fresh leaves. The signs of active feedings are manifest by the presence of numerous fresh green castings scattered on the strands. The leaves in cluster, denuded of green matter, or nibbled to the ribs, or clumsily bound together by webs, dry prematurely and the whole cluster of leaves may fall to the ground or remain suspended on the tree. The caterpillar before pupation, becomes dull and shrunk in size.

Pupa Now and then a pupa or two may be found inside a cocoon made of silken thread and castings, within the folded or webbed foliage. But in cages, provided with soil, the caterpillars have been noted to form freely cocoons of silk and sand grains, and these lie almost at the surface, barely half buried in soil. Sometimes three to five days are spent in making a suitable strong and tough cocoon of silk, within which it lies in a curled up posture. The normal pupa is brown and about 13 mm. long. The emergence of adult takes place in 11 to 14 days. The adult moth, after emergence, lives in captivity for four to five days.

Natural enemies A carabid beetle *Parena laticincta* Bates and also a reduvid bug *Occama* sp. have been noted feeding on young and old caterpillars. Both of these live long, and form no inconsiderable check on the pest. It is a common observation that these caterpillars are scarce or

absent in trees infested by the red ant *oecophylla*. In addition to the predators a braconid parasite *Hormius* sp. has also been once reared from pupating caterpillars.

Control Systematic handpicking of affected clusters with the contained insects and destroying them, forms one of the best remedies to minimise damage. The affected twigs with young or old caterpillars can be easily collected.

Spraying the foliage with calcium arsenate ($\frac{1}{2}$ oz. calcium arsenate in one gallon of water) has given satisfactory results. The caterpillars feed on the poisoned leaves and eventually die.

References

Fletcher (1914) *Some South Indian Insects*—pages 429—30. Hampson (1896)—*Fauna of British India* Vol. 4 page 125. Ramakrishna Ayyar, T. V. (1932)—*Bul. No. 27, Department of Agriculture, Madras*; -do.- (1940)—*A Handbook of Economic Entomology for South India*, page 289.

SELECTED ARTICLE

Some Plants Poisonous to Livestock

By NARAIN DAS KEHAR, M. Sc., Sc. D.,
Animal Nutrition Section,
Imperial Veterinary Research Institute, Izatnagar

Poisoning of livestock may be caused either by some of the flowerless plants such as fungi, lichens, etc., or by flowering plants such as the gramineae and leguminosae. This article deals with plants of the second group only, inasmuch as they are more extensively concerned with the poisoning of livestock.

The history of poisoning by plants in India can be traced to the remote past. The earliest mention is to be found in the *Rig Veda*, which is one of the oldest repositories of human knowledge, while further details may be gleaned from the *Charaka Samhita* and the *Shushruta Samhita*. Although some poisonous plants are protected by an unpleasant odour, an acid or bitter taste, or by spines, the poisoning of animals by such plants is of common occurrence, in spite of the widespread belief that they are protected by some instinct against eating dangerous plants. The important contributory factors incidental to poisoning are: (1) the ingestion of wilted, frosted or defoliated plants during drought, (2) the scarcity of palatable fodder during winter and early spring, (3) fatigue in transport and draught animals, (4) lack of salt, (5) a depraved appetite, (6) the fact that poisonous plants often grow in close association with palatable fodder, (7) the importation or transport of animals to new surroundings, and (8) the ingestion of poisonous plants along with hay.

Enormous losses It appears therefore that in a country such as India where a balanced feed is rarely available to animals where pastures are over grazed and grazing grounds are infested with poisonous plants, an enormous percentage of the cattle population is exposed to the dangers of poisoning. It seems, however, difficult to obtain reliable figures with regard to livestock losses sustained by plant poisoning, as only those cases are reported in which a large number of animals are involved.

The annual loss due to plant poisoning in animals in the U. S. A. is estimated to exceed $ 200,000,000 and in some years they may be even greater. In one

extensive outbreak in Texas, it was estimated that during one spring alone animals valued at $ 300,000 died from the effect of a single species of plant. Individual losses involving five to ten thousand dollars are not uncommon, while losses involving smaller amounts occur continually throughout the length and breadth of the country. Similar reports of heavy losses have been made in England, South Africa, Australia and Germany.

The death of stock is not the only loss caused by the poisonous plants; consequent losses may be manifested in the form of: (1) a drop in milk yield, (2) the loss of milk and flesh, (3) the loss of milk and wool in sheep, (4) the loss of condition in horses, (5) losses due to the action of poisonous plants on the foetus, causing either its expulsion as a result of the contraction of the uterus or its death, (6) sterility, (7) losses due to temporary or permanent injury to different organs, such as the heart, gastro-intestinal canal, kidney, liver, salivary glands and the eyes, (8) disturbances in the processes of metabolism, and (9) deformities in hoofs.

Hydrocyanic acid producing plants It is not to be expected that the losses due to plant poisoning are less in India than in the other countries mentioned above, especially as the plants incriminated in other countries also exist in India. According to the work of Chopra and Badhwar, at least 700 poisonous plants are known to exist in India even at the present day. It appears that the reason why stock poisoning cases are not brought to the public notice is that in all probability a very large number of cases and even outbreaks of plant poisoning pass unrecognized and thus remain univestigated.

It is not possible to deal with the large number of plants that are poisonous to stock but brief mention will be made only of poisoning due to some of the important hydrocyanic (prussic) acid producing plants, which form a major portion of the food of animals and are highly relished by them. *Sorghum vulgare* Pers. (*jowar*), *Sorghum halebense* Pers. (Johnson grass, *dadam*) *Sorghum vulgare sudanese* L. glax. (Sudan grass), *Triglochin maritimum* Linn. (arrow grass), *Trifolium repens* Linn. (white clover) and *Zea mays* Linn. (maize) ordinarily form nutritious fodders, but under certain climatic and soil conditions, especially in times of drought or when the plants are wilted, stunted or young they develop dangerously large quantities of hydrocyanic acid which is highly poisonous to all stock.

It is a common practice to put stock out to graze cut-over fields in the late summer and autumn and the regrowth is much relished by the animals on account of its succulent saline character and its freedom from stems. Herein, however, danger lies, since they are very rich in hydrocyanic acid.

In practical feeding, therefore, young seedlings under one foot, plants stunted owing to drought, second growths or ratoons and secondary shoots should be avoided.

It has been observed that under conditions of drought the hydrocyanic acid content of some of the crops increases to about 2½ times the original quantity. Wherever possible, either the forage affected by the above mentioned conditions should be thoroughly cured or converted into silage with water added to ensure fermentation, since it is believed that ensiling renders the hydrocyanic acid containing plants innocuous.

Feeding animals on different species of acacia is also a common practice and it is pointed out that although, as a general rule, there is little risk of poisoning as a result of the consumption of mature pods the fresh green foliage, twigs and green pods are said to be harmful at times owing to their containing hydrocyanic acid.

Linseed cake has been found to produce prussic acid poisoning and in order to destroy the enzyme or ferment responsible for liberating the hydrocyanide

from the glucoside, the cake should be treated with boiling water. The cyanogenetic gluscosides are widely distributed in plants and hydrocyanic acid has been found in 148 species of 41 families.

The chief symptoms of hydrocyanic acid poisoning are accelerated and deepened respiration, weak and irregular pulse, increased salivation and frothing at the mouth, muscular twitching, staggering as if intoxicated, anxious expression, dilatation of the pupils, convulsion, coma and death due to respiratory paralysis

Treatment *Preventive* When climatic conditions are most favourable for hydrocyanic acid poisoning sulphur should be fed to livestock as follows :—

Two tablespoonfuls of sulphur for cattle per head per day, and one teaspoonful to sheep and goats every fourth day.

Curative Because of the rapid course of hydrocyanic (prussic) acid poisoning, it is necessary to apply the treatment without delay. Bleeding is sometimes useful in removing large quantities of absorbed hydrocyanic acid and this should be followed by intravenous injections of 10 c c. of 20 per cent sodium nitrite solution and 30 c c. of 20 per cent sodium thiosulphate for cattle, and a half of this dose for sheep.

Simple tests A working guide as to the poisonous nature of the fodder may be the application of the following tests:--

(1) Strips of filter paper are dipped in a saturated solution of picric acid and dried in air. The leaves of the suspected plant are macerated, preferably by adding a few drops of chloroform, to effect the release of hydrocyanic acid from the plant cells. The macerated plant material which may have in suspected cases the odour of bitter almonds, is placed in a small bottle. When the picric acid filter paper strips are moistened with 1 per cent sodium carbonate solution and inserted with the cork in the bottle they will show the presence of hydrocyanic acid by changing colour to orange and finally to red.

(2) Cut a transverse section of the stem of suspected plant near the root, and add a small amount of tincture iodine. The changing of the cut surface to blue or black indicates the presence of hydrocyanic acid.

Enough has been said in this brief survey to indicate that the losses due to fodder poisoning in India must be enormously greater than official records would suggest. It is however, realized that in a country where animal food stuffs are extremely scarce and where the average farmer is forced by poverty to rely mainly on grazing for the feeding of his cattle, complete abstinence from the only fodder available at certain seasons is scarcely practicable. *Indian Farming, March 1943.*

Gleanings

The old order changeth—Mulch farming We are in a war we must win. Without costly soil abuse or waste, agriculture must contribute the greatest production in history All facilitating tools must be utilized. No promising methods can be left untried.

Mulch farming is such a method. It is the production of crops in imitation of Nature's way. Nature turns no plant residues under; they fall to the ground and produce a surface mulch through which succeeding crops emerge. Our reserves of soil and plant food were progressively developed under protective surface mantles of vegetation and decaying litter. Nature's method may well be imitated more closely for efficient production of agricultural crops.

Mulch farming promises increased yields and lower production costs without waste of soil. It protects soil against damage by wind and water, and it conserves moisture for crop production by increasing infiltration and retarding

evaporation. These potentialities have spotlighted this revolutionary practice, and it has already been tagged with various labels. Many call it "subsurface tillage"; others "stubble mulch" or "vegetable mulch"; "trashy tillage", "plowless fallow" or "trashy fallow", and 'stubbling-in" are older terms often used.

For generations clean tillage has been in vogue. Tradition and teaching led farmers to believe that good plowing, good coverage of crop residues and good farming were synonymous. Most of our tillage and planting equipment has been designed for this mode of culture, and the toll of erosion under this system of farming has been enormous.

The introduction of disc tillers about 1927 marked the beginning of a period during which a form of semi-covering tillage has been used extensively. Disk equipment, which partially mixes crop residue with the surface soil, replaced many plows for initial tillage, particularly in the West. Speed of travel, size, curvature and angle of discs, and number of operations largely regulated the degree of coverage obtained. Unfortunately excessive coverage and soil pulverization is too easily attained.

Previous attempts to apply the principles of mulch farming have been localized and only partially successful because of inadequate information and equipment. To make more effective use of crop residue we must have equipment that tills the soil with little or no coverage of residue and determine its proper application. The new tillers of the V or straight blade type, moldboardless plows, listers, rod weeders, or cultivators with shovel and sweep adaptations, are such noncovering implements. Developing and safely introducing this initial tillage and weeding equipment and the complementary planting machinery needed to seed grasses, legumes and grains through various mulches is an essential step in tooling for this new form of tillage.

Determining the extent to which mulch farming can be successfully implemented into local cropping programmes is a challenge to farmers and conservation technicians. (*The Tropical Agriculturist, Vol. XCIX, No. 1, 1943.*)

National health in War time According to Sir John Boyd Orr, leading nutrition expert, the health of the British people is now greatly improved despite the stringency of war conditions. In a survey made in 1935, Sir John Orr found 50 per cant of the population of Britain were under-nourished owing to bad and insufficient feeding.

His latest survey, covering 1,500 families from North Scotland to south of the Thames, showed the number of under-nourished reduced by two-thirds. Boys of thirteen in Glascow, Sir John says, are now taller by an average of 0·83 inch than the immediate pre-war average, while boys of five are 0·44 inch taller. The improvement is attributed to increased milk consumption and more oatmeal and wholemeal instead of white bread. Other points made by Sir John are: the worst fed are now better fed than ever owing to rising standard of living and public health measures, including provision of dried milk, cod liver oil and other protective foods. The distribution of available food has been brought about by rationing, increased wages, and subsidies to keep essential food prices low. With less food in the country everybody is better fed including the wealthy who used to eat too much. The consumption of calcium has increased by 25 per cent, the consumption of protein and vitamin B has also gone up.

However to achieve adequate standards, British production, says Sir John, must be increased from 25 per cent in some foods to 65 per cent in the case of milk. (*The Hindu, Madras, Oct. 12, 1943.*)

Effects of Altitude on the Chemical Composition of Cultivated Plants Experimental sowings of various cultivated plants at altitudes ranging from 1,520 m. to

2,400 m., made by S. O. Grebinsky in the Alma-Ata district of Kazakhstan. produced somewhat unexpected results *(C. R. Acad. Sci. U. R. S. S, 32. No. 4; 1941)*. In the case of sugar beet cultivated at 2,000 m., there was more sucrose and less of the undesirable non-protein nitrogen than in the roots grown at 848 m. In peas, there was an increase in monosaccharides from 1·98 to 3·63, in sucrose from 2·65 to 5·56, and a reduction in ash from 6·77 to 3·45 per cent, when plants grown at 848 m. and 2,000 m. were compared. Tobacco (*Nicotiana rustica*) grown at 2,000 m. had 5·44 per cent nicotine, as compared with 3·58 per cent for tobacco produced at 800 m. Barley has shown a doubling of the average seed weight at high altitudes, while the grains contained less protein and more carbohydrates, which should improve the malting quality The experiments suggest that many plants do better at high altitudes, and provide a basis for large scale tests which may make it possible to utilize high mountainous regions of Middle Asia for agriculture. (*Nature, March 20, 1943.*)

A new kind of cane sugar A new method of sugar manufacture which retains the vitamin and mineral values of sugarcane juice was reported by Dr. Royal Lee, of Milwaukee, before the annual convention of the Northeastern Dental Association at Swampscott, Mass., on June '28. The outstanding feature of the process as described by the discoverer is that it does not involve heating the juice. It was described as a dehydration process, the first step in which consists in filtering the cane juice and using a solvent to kill bacteria. The solvent evaporates. The juice is then frozen, forming ice crystals composed of pure water mingled with a solution which has become more concentrated by the removal of the water which forms the ice crystals. This, the inventor said, was the process used in the backwoods manufacture of apple-jack. The third step consists of chipping the frozen mass and centrifuging it. This discharges the sugar solution leaving the pure water ice behind. Repetition of the freezing and centrifuging procedure several times produced a cold process syrup, to which was added a small quantity of a grain extract which had the property of altering the attraction of the cane juice for water, making it less hygroscopic. The syrup could then be readily dried to a crystal or powder form. The result was described as a cream coloured, sweet tasting product with a pleasant, distinctive flavour, differing from other sugars in possessing a tartness like that of very sweet orange juice. Dr. Lee said that the sugar thus produced, which he called "vital sugar" contained 3½% of mineral elements, largely calcium and that the vitamin content included vitamins A, B complex, C and K, the last of which is highly effective against tooth decay. The inventor also claimed that twice as much sugar could be made from the same amount of cane juice by his process as by the customary refining process. Commercial application of the product was expected to be found in the candy, beverage and baking industries, and for special diets.

(*Sugar, August 1943.*)

Hints for Bee-keepers

For December

The month continues to be favourable for bee activity both as regards climate as well as pasturage conditions. The weather is generally mild with chill nights and bright days. The pollen sources comprise of maize, *cumbu*, *Ailanthus excela*, zinnia, sunflower and niger, and those of nectar Cambodia cotton, sunflower and niger. There is rapid comb-construction and brisk breeding. Necessary facilities may be given to accelerate these. In strong colonies excessive drone-breeding and construction of queen cells may occur. Superfluous drones and drone-brood should be destroyed. The first swarm may be allowed to come out and hived as a separate colony and the issue of subsequent

ones prevented. Honey also may be found stored in appreciable quantities in strong colonies and these should be given supers.

Colonies occurring in nature are generally in prime condition during the month. As the weather and pasturage conditions are quite favourable these colonies stand their capture and the subsequent shifting very well. The amateur may, therefore, take this opportunity to hive them and increase his stock. The success of hiving them lies in securing all the brood combs undamaged along with the bees and queen, and in the after-care of these captures, details of which are furnished in the Bulletin No. 37 of the Department of Agriculture, Madras. The hives should be located in a shady place with adequate protection against the bee-enemies, strong winds, sun and rain, and within easy reach of a good supply of pasturage. M. C. Cherian and S. Ramachandran

Correspondence

ROSES Vs. CAULIFLOWERS

The Nation's demand to Grow More Food aroused my feelings of responsibility to the Fighting Front. I had planted roses in a block of 18 cents in the first week of June 1942. I felt I had wasted the precious 18 cents. A flash came into my mind and I sowed dry crop paddy seed about 5 lb., in the same plot of 18 cents. It gave me a good crop of nearly two bags (each bag 166 lb.) of paddy but the rose plants became pale and looked shabby. After cutting the paddy good ventilation helped the rose plants and in about 20 days the plants adjusted themselves and put up a healthy growth. I turned over the soil once and after a good aeration applied ½ lb. of groundnut cake and three handfuls of well rotten cow dung per plant and thoroughly watered them. In a month fresh shoots came. Meanwhile I prepared a seed bed of Early—Patna—cauliflower, and Early Drumhead cabbage and transplanted the seedlings between the rows of rose plants. This was in the month of November 1942. Nearly 500 plants of cauliflower, and 200 plants of Early Drum-head cabbage were planted. After 20 days the first dressing of light manure was given. A fortnight later pig manure, well rotten and powdered, was applied, and watered thoroughly every ten days. The crop grew so well that even in the congenial climate of hills, you could not raise such fine cauliflower, some of which weighed even 5 lb. each, the minimum weight being ¾ lb. Nearly 1,350 lb. of cauliflower and 450 lb. of cabbages, I could get. There was an attack of caterpillars on cabbage and the crop suffered a good deal.

I applied groundnut cake to the paddy field at the rate of 246 lb. per acre. Even though the transplanting had taken place as late as August, the crop was good and 19 bags (each bag 166 lb.) per acre was the result with Samalkota No. 15 paddy variety. Leaving the old traditions to the wind, pig manure was applied with good results to the paddy.

Young India has a good deal to do. It can universally raise good crops by using good manures like oil cakes. The time has come to act. Everybody to his post—act and get—why get—it must come—what?—the result—the bumper crop.

Pithapuram (Sd.) V. G. Krishna

Crop and Trade Reports

Paddy—First Report—1943-44 The average area under paddy in the Madras Province during the five years ending 1941-42 represents 13·3 per cent of the total area under paddy in India. The area sown with paddy up to the 25th September, 1943 is estimated at 6,582,000 acres. When compared with the area of 6,179,000 acres estimated for the corresponding period of last year, it reveals an increase of 6·5 per cent. The area estimated is the same as that of last year in Coimbatore. An increase in area is estimated in the other districts of the

Province except in Vizagapatam, Kurnool, Anantapur, Chingleput, South Arcot, Trichinopoly, Tanjore and Ramnad. The variations are marked in Kistna (+118,000 acres), Chingleput (−99,000 acres), Chittoor (+103,000 acres), North Arcot (+127,000 acres), Tanjore (−128,000 acres) and Malabar (+72,000 acres). The increase in area is attributed partly to the 'Grow more food campaign' and partly to the prevalence of high prices for paddy.

The first crop of paddy is being harvested in parts of the district of East Godavari, Chingleput, North Arcot, Salem, Coimbatore, Trichinopoly, Tanjore, Madura, Malabar and South Kanara. The yield per acre is expected to be normal in Chingleput, North Arcot, Salem, Coimbatore and Trichinopoly and slightly below the normal in parts of East Godavari, Tanjore, Madura, Malabar and South Kanara. The condition of the standing crop is generally satisfactory.

The average wholesale price of paddy, second sort, per imperial maund of 82$\frac{2}{7}$ lbs as reported from important markets on 9th October 1943, was Rs. 7--10--0 in Mangalore, Rs. 6—10—0 in Madura, Rs. 6--8—0 in Vellore, Rs. 6—1—0 in Guntur, Rs. 6—0—0 in Masulipatam and Tinnevelly, Rs. 5—13—0 in Bezwada, Rs. 5—11—0 in Ellore, Rs. 5—9—0 in Cocanada, Rs. 5—7—0 in Rajahmundry, Rs. 5—6—0 in Conjeevaram, Rs. 5—3—0 in Trichinopoly, Rs. 4—15—0 in Kumbakonam, Rs. 4—14—0 in Negapatam and Re. 4-12-0 in Cuddalore. When compared with the prices published in the last report, i. e., those which prevailed on 6th February 1943, these prices reveal a rise of 39 per cent in Nagapatam, 25 per cent in Kumbakonam, 22 per cent in Trichinopoly, 20 per cent in Masulipatam, and Guntur, 19 per cent in Madura, 17 per cent in Cocanada, 16 per cent in Bezwada, 14 per cent in Ellore, 13 per cent in Vellore and 7 per cent in Rajahmundry and a fall of 16 per cent in Tinnevelly and 4 per cent in Cuddalore. *(From the Commissioner of Civil Supplies, Madras).*

Paddy—Intermediate Condition report 1943-44 The harvest of first crop of paddy has either concluded or is concluding in parts of Chingleput, the Central districts, the South and the West Coast. The yield per acre is reported to be normal in the Central districts and generally below the normal elsewhere. The condition of the main crop of paddy is generally satisfactory in all the districts except in Chingleput where the heavy rains of October affected the standing crop to some extent.

The wholesale price of paddy, second sort, per imperial maund of 82$\frac{2}{7}$ lbs. as reported from important markets on 6th November 1943 was Rs. 8—3—0 in Madura, Rs. 7—9—0 in Mangalore, Rs. 6—8—0 in Vellore, Rs. 6—4—0 in Nellore, Rs. 6—3—0 in Ellore and Guntur, Rs. 6—2—0 in Masulipatam, Rs 6—1—0 in Bezwada, Rs. 6 in Tinnevelly, Rs. 5—13—0 in Cocanada, Rs. 5-7-0 in Rajahmundry, Rs. 5-4-0 in Trichinopoly, Rs. 4-15-0 in Kumbakonam, Rs. 4-14-0 in Negapatam, Rs. 4-2-0 in Cuddalore and Rs. 4-1-0 in Conjeevaram. When compared with the prices published in the last report, i. e., those which prevailed on 9th October 1943, these prices reveal a rise of approximately 24 per cent in Madura, 9 per cent in Ellore, 5 per cent in Cocanada, 4 per cent in Bezwada, 2 per cent in Masulipatam, and Guntur and 1 per cent in Trichinopoly and a fall of approximately 24 per cent in Conjeevaram, 13 per cent in Cuddalore and 1 per cent in Mangalore, the prices remaining stationary in Rajahmundry, Vellore, Kumbakonam, Nagapatam and Tinnevelly. *(From the Commissioner of Civil Supplies, Madras)*

Sugarcane—Second report—1943 The average area under sugarcane in the Madras Province during the five years ending 1941-42 represents 3·1 per cent of the total area under sugarcane in India. The area planted with sugarcane up to the 25th September 1943 is estimated at 138,150 acres. When compared with the area of 116,390 acres estimated for the corresponding period of the previous year, it reveals an increase of 18·7 per cent. A slight decrease in area is revealed

in Vizagapatam, East Godavari, Guntur, Kurnool, Ramnad and Tinnevelly and the area has increased in the other districts, especially in Anantapur (+1,070 acres), South Arcot (+5,250 acres), Chittoor (+3,000 acres), North Arcot (+4,400 acres), Salem (+1,300 acres), Trichinopoly (+4,200 acres) and Madura (+1,400 acres). The increase in area is due mainly to the high price of jaggery at the time of planting.

The condition of the crop is satisfactory on the whole. The seasonal factor for the Province as a whole works out to 100 per cent as against 97 per cent for the corresponding period of last year. The total yield for the Province in terms of jaggery is accordingly estimated at 422,550 tons as against 343,110 tons for the corresponding period of last year representing an increase of 23·2 per cent.

The wholesale price of jaggery per imperial maund of 82$\frac{2}{7}$ lb. as reported from important markets on 9th October 1943 was Rs. 15-13-0 in Erode, Rs. 13-13-0 in Salem, Rs. 13—8—0 in Vizagapatam, Rs. 12—12—0 in Cuddalore, Rs. 12—6—0 in Rajahmundry, Rs. 11—12—0 in Mangalore, Rs. 11—8—0 in Cocanada, Rs. 11—2—0 in Bellary, Rs 10-4-0 in Trichinopoly and Chittoor, Rs. 10-1-0 in Vizianagaram and Adoni, Rs. 9-8-0 in Vellore and Rs. 9-2-0 in Coimbatore. When compared with the prices published in the last report, i. e., those which prevailed on 4th September 1943, the above prices reveal a rise of approximately 24 per cent in Cocanada 10 per cent in Cuddalore and 8 per cent in Rajahmundry and a fall of approximately 18 per cent in Coimbatore, 10 per cent in Trichinopoly, 8 per cent in Vellore, 6 per cent in Mangalore, 2 per cent in Salem and 1 per cent in Chittoor, the prices remaining stationary in Vizianagaram, Adoni, Bellary and Erode. (*From the Commissioner of Civil Supplies, Madras*)

Groundnut—Third forecast report—1943 The average area under groundnut in the Madras Province during the five years ending 1941-1942 represents 42·4 per cent of the total area under groundnut in India. The area sown with groundnut up to 25th September 1943 is estimated at 2,911,000 acres. When compared with the area of 2,799,200 acres estimated for the corresponding period of the previous year it shows an increase of 4·0 per cent. The area estimated is the same as that of last year in Tinnevelly. An increase in area is estimated in the other districts of the Province except in the Deccan, Nellore, Chittoor, North Arcot, Salem and Trichinopoly and is due mainly to the prevalance of high prices for groundnut. The variations are marked in Vizagapatam (+48,000 acres), Kistna (+115,000 acres), Bellary (-113,000 acres), Anantapur (-40,000 acres) and South Arcot (+103,000 acres).

The summer crop has been harvested. The yield was normal except in parts of Chingleput, South Arcot and Ramnad where it was slightly below normal. The yield of the early crop was normal in Coimbatore and below the normal in Salem due to unfavourable weather conditions and to insect attacks in parts.

The condition of the main crop is reported to be satisfactory outside Vizagapatam, Kistna, Guntur, the Deccan (Cuddapah excepted), Salem and Madura where it was affected by drought to some extent in the early stages of its growth. In parts of Salem and Madura, the crop suffered in some degree from attacks by insect pests.

The wholesale price of groundnut (machine shelled) per imperial maund of 82$\frac{2}{7}$ lb. as reported from important market centres on the 16th October 1943 was Rs. 12—9—0 in Vizianagaram and Bellary, Rs. 12—6—0 in Erode, Rs. 12—5—0 in Cuddapah, Rs. 12—4—0 in Adoni, Rs. 12—1—0 in Guntur, Cuddalore and Vellore, Rs 11—13—0 in Hindupur, Rs 11—5—0 in Nandyal, Rs 11—4—0 in Guntakal, Rs. 11—3—0 in Salem, and Rs. 10—9—0 in Vizagapatam. When compared with the prices published in the last report, i. e., those which prevailed on 7th August 1943, these prices reveal a fall of 17 per cent in Vizagapatam, 13 per cent in Guntakal, 10 per cent in Salem, 9 per cent in Nandyal, 6 per cent in Erode, 4 per

cent in Vizianagaram, Guntur, Cuddapah, Cuddalore and Vellore, 2 per cent in Hindupur, and one per cent in Adoni, the price remaining stationary in Bellary. *(From the Commissioner of Civil Supplies, Madras)*

Groundnut—Intermediate condition report—1943–44 The winter crop of groundnut has been affected to some extent by drought in the early stages of its growth in parts of Kistna, Guntur, Nellore, and Salem, by the heavy rains of October in parts of Chingleput and North Arcot and by insect pests in parts of Salem. The condition of the crop is generally satisfactory in the other districts.

The wholesale price of groundnut (machine shelled) as reported from important market centres on 6th November 1943 per imperial maund of 82$\frac{2}{7}$ lb. was Rs 12-9-0 in Bellary, Rs 12-1-0 in Adoni, Rs 11-11-0 at Cuddapah and Vizagapatam, Rs. 11-9-0 at Vizianagaram, Rs. 11-4-0 at Guntakal, Rs. 11-3-0 at Nandyal, Vellore, Cuddalore and Erode, Rs. 11-0-0 at Salem and Rs. 10-15-0 at Guntur. When compared with the prices published in the last report, i. e., those which prevailed on 16th October 1943, these prices reveal a fall of 10 per cent at Erode and Guntur, 8 per cent at Vizianagaram, Vellore and Cuddalore, 5 per cent at Cuddapah, 2 per cent at Adoni and 1 per cent at Nandyal and Salem and a rise of 11 per cent at Vizagapatam; the prices remaining stationary at Guntakal and Bellary. *(From the Commissioner of Civil Supplies, Madras)*

Gingelly—Second forecast report—1943-1944 The average area under gingelly in the Madras Province during the five years ending 1941-1942 represents 15·6 per cent of the total area under gingelly in India. The area sown with gingelly up to the 25th September 1943 is estimated at 472,000 acres. When compared with the area of 490,500 acres estimated for the corresponding period of last year, it reveals a decrease of 3·8 per cent. The estimated area is the same as that of last year in South Kanara. An increase in area is estimated in East Gadavari, (+11,000 acres), West Godavari, Kistna, Guntur, Bellary, Cuddapah, Nellore, Chingleput, Coimbatore, Tinnevelly and Malabar and a decrease in area in the other districts of the Province.

The early crop of gingelly has been harvested in parts. The yield per acre was normal except in parts of Vizagapatam, Kistna, Salem, and Coimbatore. The main crop of gingelly was affected by drought to some extent in the early stages of its growth in the Deccan. The condition of the crop is fairly satisfactory in the other districts of the Province.

The wholesale price of gingelly per imperial maund of 82$\frac{2}{7}$ lb. as reported from important markets on 16th October 1943 was Rs. 18-7-0 in Trichinopoly, Rs. 16-5-0 in Salem, Rs. 15-15-0 in Tinnevelly, Rs. 15-14-0 in Ellore, Rs. 15-11-0 in Cuddalore, Rs. 15-8-0 in Tuticorin, Rs. 15-1-0 in Cocanada, Rs. 14-14-0 in Rajahmundry, Rs. 14-13-0 in Vizagapatam and Rs. 13-5-0 in Vizianagaram. When compared with the prices published in the last report, i. e., those which prevailed on 7th August 1943, these prices show a rise of 28 per cent in Vizagapatam, 17 per cent in Trichinopoly, 14 per cent in Ellore, 11 per cent in Cocanada and Rajahmundry, 7 per cent in Tinnevelly, 6 per cent in Salem, 5 per cent in Tuticorin and 2 per cent in Cuddalore, the price remaining stationary in Vizianagaram. *(From the Commissioner of Civil Supplies, Madras)*

Cotton—Second forecast report—1943–44 The average of the areas under cotton in the Madras Province during the five years ending 1941–42 represents 9·8 per cent of the total area under cotton in India. The area under cotton up to 25th September 1943 is estimated at 744,100 acres. When compared with the area of 856,900 acres estimated for the corresponding period of last year, it reveals a decrease of 13·2 per cent.

Central Districts and South—mainly Cambodia tract The area in the Central districts and the South relates partly to the last year's crop and partly to the current year's sowings which have commenced in parts.

White and Red Northerns tract The area under White and Red Northerns rose from 100.000 acres to 103,000 acres, i. e., by 3·0 per cent.

Westerns tract The area under Westerns fell from 438,000 acres to 367,200 acres, i. e., by 16·2 per cent. The decrease in area occurs mainly in Bellary and Cuddapah and is due chiefly to the prohibition of the cultivation of pure *mungari* cotton.

Warangal and Cocanadas tract The area under Warangal and Cocanadas cotton fell from 80,800 acres to 72,000 acres, i. e., by 10·9 per cent. The decrease in area occurs mainly in Guntur due to increase in the area under food crops.

The condition of the crop is generally satisfactory in all the districts.

The average wholesale price of cotton lint per imperial maund of 82$\frac{2}{7}$ lb. as reported from important markets on 2nd October 1943 was Rs. 37--1—0 for Cocanadas. Rs. 34-13-0 for White Northerns, Rs. 34-9-0 for Red Northerns. Rs. 31-15-0 for Westerns (*Mungari*, Rs. 29—2—0 for Westerns (*Hingari*), Rs. 74—15—0 for Coimbatore Cambodia, Rs. 55—0—0 for Virudhunagar, (Southern) Cambodia, Rs. 62—3--0 for Coimbatore *Karunganni*, Rs. 50—11—0 for Tinnevellies and Rs. 38—5—0 for *Nadam* cotton. When compared with the prices published in the last report, i. e., those which prevailed on 4th September 1943, these prices reveal a rise of approximately 7 per cent in the case of Tinnevellies, 6 per cent in the case of Virudhunagar (Southern) Cambodia, 4 per cent in the case of Coimbatore *Karunganni*, 3 per cent in the case of *Nadam* cotton and 2 per cent in the case of Coimbatore Cambodia. The prices of Cocanadas, White Northerns, Red Northerns and Westerns (*Mungari* and *Hingari*) remained stationary. (*From the Commissioner of Civil Supplies, Madras*)

Cotton—Intermediate condition report—1943-44 In the central districts and the south the sowings of cotton are still in progress. The area under the crop is reported to be normal or slightly above normal in the south and slightly below normal in the central districts due chiefly to the food production drive.

In the Deccan the sowings of *hingari* or late sown cotton are reported to be almost normal. The yield of the *mungari* or early sown crop is expected to be below normal in parts of the Deccan due to the set back in the early stages of its growth and the prolonged wet weather in September and October.

The local cotton trade is not generally active at this time of the year. The average wholesale price of cotton lint per imperial maund of 82$\frac{2}{7}$ lb. as reported from important markets on 8th November 1943 was Rs. 37—14—0 for Cocanadas, Rs. 34-13-0 for White Northerns, Rs. 34-9-0 for Red Northerns. Rs. 27-3-0 for Westerns (*Mungari*), Rs. 21-1-8 for Westerns (*Hingari*), Rs. 71-12-0 for Coimbatore Cambodia, Rs. 60-2-0 for Coimbatore *Karunganni* and Rs. 37-4-0 for *Nadam* cotton. When compared with the prices published in the last report, i. e., those which prevailed on 2nd October 1943, these prices reveal a rise of approximately 2 per cent in the case of Cocanadas and a fall of approximately 15 per cent in the case of Westerns (*Mungari*), 28 per cent in the case of Westerns (*Hingari*), 4 per cent in the case of Coimbatore Cambodia and 3 per cent in the cases of Coimbatore *Karunganni* and *Nadam*, the prices remaining stationary in the case of White and Red Northerns, (*From the Commissioner of Civil Supplies, Madras.*)

Cotton, raw, in the Madras Province The receipts of loose cotton at presses and spinning mills in the Madras Province from 1st February to 29th October, 1943 amounted to 368,349 bales of 400 lb. lint as against an estimate of 406,300 bales of the total crop of 1942—43. The receipts in the corresponding period of the previous year were 641,278 bales. A total quantity of 553,260 bales mainly of pressed cotton was received at spinning mills and 1,908 bales were exported by sea while 226,556 bales were imported by sea mainly from Karachi and Bombay. (*From the Director of Agriculture, Madras.*)

College and Estate News

Students' Corner—Students' Club Under the auspices of the Students' Club a meeting was held on 25th October '43 when Sri C. Vincent read a paper on the 'Sons of the soil'. Sri T. Nataraj, B. A., B. Sc., Ag. presided.

At another meeting held on the 19th November '43, Mr. Rhind, Economic Botanist, Burma, gave a resume of the work done on *sesamum*. Sri C. M. John, Oil Seeds Specialist, occupied the chair.

Games *Hockey* Two matches were played against R. S. Puram and Sporting Union teams; the former ended in a draw and in the latter we were successful.

In the series of matches played in connection with the Coimbatore Athletic Association Hockey Tournament our team came out successful and has reached the finals.

Cricket The Rhondy Shield match played against Stanes' European High School could not be completed. We were defeated by 2 runs and 4 wickets in a trial against the R. I. N. team.

The match with Officers XI ended in time draw. Officers XI–152. (S. D. S. Albuquerque 38, K. M. Thomas 31, C. Ramaswami 29, K. S. Alwa 3 for 21, R. Narasimham 4 for 43) Students' XI–113, (R. Narasimham 47 not out, A. S. Krishnan 36, M. Mukundan 5 for 43.)

Educational Tour The students of B. Sc. (Ag.) class III were taken on a tour from 1st to 13th November '43. The party was led by Sri V. T. Subbiah Mudaliar, Junior Lecturer in Agriculture; Sri K. C. Ramkrishnan, Lecturer in Agricultural Economics and Sri A. H. Subramania Sarma, teaching Assistant in Agriculture accompanied the party. In the tour, Tanur, Calicut, Taliparamba, Kasaragode and Mangalore were visited for the study of local agriculture and experimental work in the Agricultural Research Stations of the West Coast.

The Agricultural Officers' Club Day The annual club day was celebrated on 30th October '43 with great *eclat*. The annual dinner was held on the 29th night and rest of the activities connected with the club day was held on the 30th amidst a variety of interesting games and amusements. The President Sri V. T. Subbiah Mudaliar distributed the prizes to the winners in the several competitions.

The Agricultural College Ladies' Club Day The annual club day was celebrated on 20th November '43. A large number of ladies and children of the estate participated in the sports and entertainments. The President, Mrs. P. D. Karunakar gave away the prizes to the winners. Mrs. P. D. Karunakar won the championship cup. The function terminated with the distribution of sweets and pansupari.

OBITUARY

We regret to report the untimely passing away of Sri K. R. Ramaswami, B. Sc. Ag., under very tragic circumstances. He took his degree in 1931, and worked as a fieldman until very recently when he was promoted and posted as Agricultural Demonstrator, Salem.

Brilliant in his studies, unostentatious in his work, he endeared himself to one and all. We convey our heart felt condolences to the members of the bereaved family.

Departmental Notifications

Gazetted Service—Appointments

Sri G. Seshadri Aiyengar, a servant of the Indian Central Cotton Committee, is appointed to act as Assistant Cotton Specialist, Mungari Cotton Improvement Scheme, Adoni, Bellary District.

Sri M. Bhavani Shanker Rao, Assistant in Oil Seeds Section, is appointed to act as Assistant Oil Seeds Specialist, for the Scheme of Research on storage of Groundnut in Madras.

Sri V. Achyutharamayya, F. M. A. R. S. Samalkota, is appointed as District Agricultural Officer for special duty on Pest Act work.

Sri E. R. Gopala Menon, Assistant in Entomology, is appointed to act as Assistant Entomologist for the scheme of research on insect pests of stored oil seeds (groundnuts).

Sri V. Margabhandu, Assistant in Entomology, is appointed to act as Assistant Entomologist, Coimbatore with effect from the date of taking charge, *vice* Sri P. N. Krishna Ayyar granted leave.

Sri K. Govindan Nayar, Assistant in Chemistry is re-appointed to officiate as Assistant Agricultural Chemist, Coimbatore, *vice* Sri M. Suryanarayana, granted leave.

Sri G. Sakharama Rao, A. D. Karkal, is re-appointed to officiate as District Agricultural Officer, Trichinopoly, *vice* Sri T. G. Anantarama Ayyar, granted leave.

Sri V. Sadagopa Ayyangar, A. D. (Tanjore District) to officiate as Assistant Marketing Officer, Madras for grading and marketing of certain superior varieties of rice.

Sri S. Venkatarama Ayyar, F. M. A. R. S. Palur to officiate as District Agricultural Officer, Nellore.

Transfers

Sri A. Gopalakrishniah Nayudu, D. A. O. Nellore to be D. A. O. Guntur.

Sri A. Chidambaram Pillai, D. A. O. Guntur to officiate as Asst. Marketing Officer, Madras.

Leave

Sri A. Ramaswami Ayyar, Assistant Marketing Officer, Madras, is granted leave on half average pay for 6 months and 15 days from 15—8—'43.

Subordinate Services—Promotions

The following promotions as Upper Subordinates in the new III Grade have been ordered with effect from 15-11-43.

Sri N. Muthuswami Nayudu, Laboratory Assistant in Entomology section, to officiate as Assistant in Entomology Section, Coimbatore.

Sri I. L. Narasimhalu, Laboratory Assistant in Mycology section, to be temporary Assistant in the Mycology section, Coimbatore.

Sri J. Vaidyanathan, fieldman A. R. S Palur to officiate as F. M. A. R. S. Palur.

Sri A. V. Parthasarathi, Fieldman A. R. S. Hagari, to officiate as Assistant in Millets, A. R. S. Hagari.

Sri K. R. Ramaswami, Fieldman A. R. S. Palur to officiate as A. D. Salem District.

Sri A. G. Kesava Reddi, Fieldman A. R. S. Hagari to officiate as A. D. Anantapur District.

Sri S. Arunachalam, Fieldman, A. R. S. Tindivanam, to be temporary Assistant in Oil Seeds at Tindivanam.

Sri E. S. Kothanda Raman, Fieldman, Paddy section, Coimbatore to officiate as Agricultural Marketing Assistant, Madras.

Sri K. Kelukutti Menon, Fieldman, Paddy section, Coimbatore, to officiate as Assistant in Oil Seeds section, Coimbatore.

Sri K. Santhanam, Fieldman, Central Farm, Coimbatore, to officiate as Upper Subordinate Agricultural Section.

Sri K. R. Sundaresan, Fieldman, S. R. S. Gudiyattam; to officiate as A. D N. Arcot, District.

The following candidates are appointed to officiate as Upper Subordinates in the III Grade with effect from 15—11—'43.

Name of officer	Posting
Sri Vaddi Rama Rao	A. D. West Godavari Dt.
Janab Mirsa Anser Baig Sahib	A. D. Bellary Dt.
„ C. V. Ummer Kutty Sahib	A. D. Malabar Dt.
„ D. A. Syed Muhammed Sahib	A. D. Salem Dt.
„ K. A. Shaukat Ali Sahib	A. D Trichinopoly Dt.
Mr. George H. Maduram	A. D. Tinnevelly Dt.
Sri A. Radhakrishna Reddi	A. D. Chingleput Dt.
„ T. V. Palaniswami	A. D. Coimbatore Dt.
„ C. Srinivasan	A. D. Chittoor Dt.
„ R. Narayanamurthi	A. D. Guntur Dt.
„ S. T. Srinivasan	A. D. Ramnad Dt.
„ C. R. Thiruvengadam	A. D. North Arcot Dt.
„ T. Sivasubramaniam	A. D. South Arcot Dt.
„ M. Dhanvantari Reddi	A. D. Nellore Dt.
„ T. P. Shanmuga Nayanar	A. D. Madura Dt.
„ G. Prabhakara Reddi	A. D. Anantapur Dt.
„ M. Murthi Raju	A. D. Kandukur, Nellore Dt.
„ P. K. Sivasubramaniam	A. D. Tanjore Dt.
„ G. Venkataramana Reddi	A. D. Chittoor Dt.
„ R. Narasimha Reddi	A. D. Kurnool Dt.
„ V. Ramanna	A. D. Guntur Dt.
„ K. Srinivasan	A. D. Chittoor Dt.
„ B. Hanumantha Rao	A. D. Cuddapah Dt.
„ N. V. Gopalakrishna Sarma	A. D. Kurnool Dt.
„ K. Ramakrishna Sastri	A. D. Kanigiri, Nellore Dt.
„ K. Thandavarayan	Asst. in Oil Seeds, Groundnut Storage Scheme, Cuddalore
„ C. V. Govindaswami	Assistant in Mycology, Coimbatore
„ N. Ramesh Adyanthayya	do. do. do.
„ I. Achyutarama Raju	Assistant in Entomology, Coimbatore
„ K. Ranga Rao	Assistant in Fruits, College Orchard, Coimbatore
„ C. Ramakanta Reddi	A. R. S. Samalkota
„ Y. R. Sundara Rao	Asst. in Oil Seeds, Groundnut Storage Scheme, Masulipatam
„ T. K. Tiruvengadachari	Assistant in Chemistry, Siruguppa
„ K. V. S. Suryanarayanamurthi	Assistant in Chemistry, Coimbatore
„ K. Sambamurthi	Assistant in Fruits, Bio-Chemistry Section, F. R. S. Kodur
„ G. R. Padaki	Asst. in Cotton, Mungari Scheme, Adoni

Posting and Transfers

Name of officer	From	To
Sri K. Narayana Kamath	A. D. under training in Malabar District	A. D. Coimbatore
„ G. Ramalingam	A. D under training in Darsi (Nellore Dt.)	F. M. A. R. S. Guntur
„ M. Satyanarayana	F. M. A. R. S. Guntur	A. D. Cocanada
„ A. Rama Doss	A. D. Arantangi	A. D. Virdhachalam
Janab S. Khadir Razak Sahib	A. D. Koilkuntla	A. D. Cuddapah
Sri J. V. V. Suryanarayana	Asst. in Chemistry, Siruguppa	A. D. Amalapuram
„ L. Krishnan	F. M. A. R. S. Palur	A. D. Uthamapalayam
„ K. Varadachari	A. D. Gooty	A. D. Saidapet
„ P. Lakshmana Babu	A. D. under training in Kistna Dt.	A. D. Vizagapatam
„ A. Subba Raju	Asst. in Cotton, Mungari Scheme, Adoni	A. D. in Kistna Dt. for training
„ M. Damodara Prabhu	F. M. A. R. S Kasargod	A. D. Mangalore
„ K. Rajasekhara Shetty	F. M. Siruguppa	Asst. in Fruits, A. R. S. Taliparamba
„ T. Gopalan Nayar	Asst. in Fruits, A. R. S. Taliparamba	A. D. Palghat
„ K. Govindan Nambiar	A. D. Palghat	A. D. Calicut
„ A. Venkatarangam	A. D. Rapur	A. D. Nellore
„ U. Sanyasi Rao	Under training at Sulurpet	A. D. Rapur
„ G. Ramalingam	A. D. Kandukur	A. R. S. Guntur
Janab K. Fazlulla Khan Sahib	Asst. in Fruits, College Orchards, Coimbatore	Asst. in Charge of Kallar and Burliar Fruit Stations, Mettupalayam
Sri R. Shanmukha-sundaram	Kallar and Burliar Fruit Station, Mettupalayam	Asst. in the Scheme for Banana fibre, College Orchards, Coimbatore
Janab Muhamad Faziuddin	A. D. Nandigama	Food Inspector, under Grain Purchase Officer, Tadepalligudem
Sri Achyutan	A. D. Tiruvur	do.
„ G. Sitarama Sastri	A. D. Sattanapalli	do.
„ K. Mahabala Shetty	A. D. Kudligi	A. D. Hospet
„ T. D. Muthuswamy	A. D. Siruguppa	A. D. Adoni
„ S. Krishnamurthi Rao	A. D. Alur	A. D. Bellary

Leave

Name of officer	Period of leave
Sri R. Narasimha Ayyar, A. D. in Mycology, Vellore	L. a. p. for 1 month from 10-11-43
„ K. L. Ramakrishna Rao, A. D. Tiruttani	L a. p for 1 month from 4-12-43
„ P. Vishnu Somayajulu, Asst. in Mycology, Coimbatore	L. a. p. for 3 months from 1-12-43 preparatory to retirement
„ S. V. Naidu, A. D. Markapur	Extension of leave on half average pay on m. c. for 4 months from 2-10-43
„ N. S. Rajagopala Ayyar, A.D. Cheyyar	L. a. p. for 1 month from 25-10-43
„ V. Gomathinayagam Pillai, Asst. in Millets Section, Coimbatore	L. a. p. for 1 month from 1-11-43
„ K. Sitarama Ayyar, A. D. Attur	Extension of l. a. p. for 4 months from 7-7-43
„ N. Krishna Pillai, A. D. Pollachi	Extension of l. a. p. for one and half months

The Madras Agricultural Journal

(ORGAN OF THE M. A. S. UNION)

Vol. XXXI DECEMBER 1943 No. 12.

EDITORIAL

Increasing Production of Milk That the production of milk in the country is short and inadequate and needs to be improved, and improved greatly, needs no emphasis. It is also true that for achieving this end, a well-thought-out, long-sustained, definite and vigorous policy in breeding is required, combined with proper feeding, care and management of cattle. The essential principles in breeding for milk enunciated by Mr. John Hammond in his paper on "Improved Breeding for Milk Production" and printed elsewhere in this issue, is of more than passing interest to us. He emphasises the importance of selecting the bulls also, just as in the case of cows, and this is a point that the breeders are apt to miss. That the production of milk is increased by milking cows three times a day has been the experience of some. Milking three times a day would result in stimulating the secretion of milk, the development of the milk producing tissue and an increased blood supply to the udder, especially when adopted from the first lactation onwards. These merit the attention of those responsible for advising the country about the development of cattle and the increased production of milk.

What Mr. Hammond says would appear to be particularly applicable to India. He points out how by using proven bulls exclusively for two generations, a low producing, non-descript herd could be made into a herd of reasonably good production. This finding is of special interest to this country where the cows are mostly non-descript animals and there are no 'proven bulls'. There is no such definite policy for improving milk by breeding, excepting a kind of grading-up. There is also no general system of recording milk production and no method of knowing the parentage of animals. The recording of the production of milk from individual animals and of the parentage of animals, both milking cows and breeding bulls, as a general practice, would appear to be the first step in the improvement work. Such recording alone would enable one to pick out good animals and animals with outstanding merit. The country is fortunately not wanting in good animals. The recording of milk done at the Government Stations and similar institutions has shown that some buffalo-cows have passed the 7,500 lb. milk limit and some cows the 10,000 lb. mark, in one lactation. There are possibly many such animals in the country. Such milkers should provide the necessary bull calves for initiating the breeding work. The

capacity of these bull calves to transmit their milk characters to their daughters may need to be ascertained by systematic milk recording. When the bulls are known to transmit their milk characters, they should be utilised to the fullest extent for breeding purposes.

Each bull can serve a maximum of 80 to 100 cows in a year, on a liberal estimate, while the same bull can fertilise about 1,000 cows, if artificial insemination is resorted to. Artificial insemination is a regular large scale practice followed in Soviet Russia and the United States of America, countries that attempt things on a mass scale, with staggering results in the end The adoption of artificial insemination assumes a large cow population normally. Individual owners do not maintain big herds in the country, but the required number of cows could be secured through the co-operation of cow-owners in adjacent villages. Methods of preserving the semen for a number of days have been developed and these are being improved upon everyday, and artificial insemination has immense possibilities and a big future. It is admitted that there are considerable difficulties to be surmounted in the breeding programmes suggested, but really nothing great is achieved without adequate effort These will tax all the resources of the people in charge of improvement work and to them we commend the above.

Good breeding methods alone are not enough. Side by side with breeding should commence a better system of feeding, care and management. We are not suggesting or asking for the impossible. Other countries have done it and it should not be impossible in this country. Increasing the production and consumption of milk is a national necessity and should not be postponed any longer without sacrificing the little health and the poor stamina of the people.

The feeding of animals has to be rationalised, if the increased production of milk is to be secured and kept up. More fodder will have to be produced and quality fodder will have to be aimed at. It will be necessary for the fodders to replace to an extent other crops, whose production may in consequence get reduced slightly. It is inevitable. Even as it is, the production of food grains in this country is in defect and a suggestion to reduce it further might sound fallacious. It is said that the war has emphasised the necessity for every country being self-contained with regard to the production of the primary food grains. The other view is that densely populated countries should specialise in the production of the necessary perishable food produce like milk, fruits, vegetables, etc. and import grains from less populous and extensive-cultivation areas or countries. War cannot be a perpetual phenomenon and national programmes should not be drawn up with war conditions as a primary basis, leading to a perpetual conflict between peace conditions and national programmes. We would rather say, be self-contained with regard to production of food grains, if possible, but certainly be self-contained with regard to the perishable vegetable, fruit and milk produce, war or no war.

Fish Rearing in Paddy Fields on the Agricultural Research Station, Aduturai, Tanjore District

By M. ANANDAN, L. Ag.,
District Agricultural Officer, Tanjore

There are over a million acres of wet land of very flat nature in the Cauvery delta which are under swamp paddy from June to January. The irrigation source is the Cauvery river and its numerous distributories. Water from the river is conveyed through the main channels from which, branch or field channels take off and deliver the water direct into the paddy fields. With the construction of the Mettur Reservoir, the supply of water has been so well regulated that there is hardly any dearth of supply at any time during the irrigation season. With such assured water supply for 8 months in the year the writer, as Superintendent in charge of the Agricultural Research Station, Aduturai, thought it worth while to start rearing of fish in paddy fields with suitable precautions. The experiment was started in 1933—34 paddy season. As indigenous varieties of fish including many species of carps naturally occur in the river water, artificial rearing of the fry was not attempted, but precautions were taken to see that fish that once entered the block of land selected for the experiment were never allowed to escape, by the provision, at the drainage vents of 'V' shaped bamboo screens which allowed entry of the fish into the paddy fields but not their escape (see fig. 1.) The vent through which irrigation water was allowed to enter the block of land was completely screened off by close meshed wire netting. The provision of 'V' shaped screen was made at the drainage vent, purposely to take advantage of the natural tendency of all fish to swim against the current. Streams of fish could be seen forcing their way through the narrow slit in the 'V' shaped screen and against the flowing water. The block of land selected was about 12 acres in extent with two parrallel rows of fields, 14 in each row, with a long common bund dividing the two rows of plots. The length of this common bund was nearly 1500 feet running west to east. These fields are planted to two crops of paddy during the season of 8 months, the first crop occupying the ground

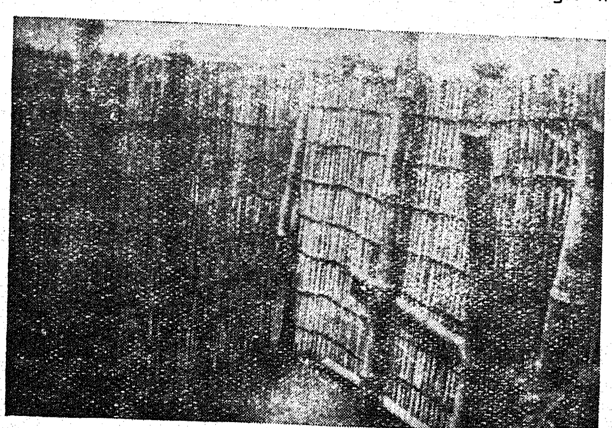


Fig. 1. 'V' shaped bamboo screen.

from June to the end of September and the second crop from October to the end of January or the middle of February. The fish on entering were free to move about in all the fields of the experimental block. But it was soon realised that conditions became unsuitable for fish to thrive when the fields were ploughed or when water went down in depth (below 2 inches) in the fields. Young fish, particularly of carps, were also noticed to die in large number when temperature of the water in the experimental fields rose beyond 36°C. Such high temperature prevails on almost all days from June to the middle of September during the hours 12 noon to 3 in the after-noon in the unplanted fields in the delta. Within 20 days after planting a paddy crop, the shade produced by the rapidly tillering paddy plants was sufficient to prevent the rise in temperature of the water in the fields and to protect the young fish from heat stroke. To save the fish from the ill-effects of the above conditions, a central trench 2 feet in width and 2 feet in depth was dug in the place of the central long bund. (See fig. 2.) This trench was in turn connected to a 6 feet wide and 8 feet deep trench of about 26 feet length at the head of the block of land through which water was let in for irrigating the whole block.

Fig. 2. Central trench connecting the fish pond.

At the end of the paddy season in January, the water supply is cut off from Mettur and in consequence, the rivers, the channels and the paddy fields dry up with the result that the fish either perish or are caught by the people irrespective of their size or weight. A certain number, of course, escape into the numerous village tanks scattered all over the delta but a large proportion of the young and small fish generally perish. The big trench at the head of the experimental block served to give shelter to the fish and carry them over to the next irrigation season through the dry months, February to May. This trench was subsequently widened and deepened into a fish pond occupying about 7 cents in area and 300 to 400 lb. of mature fish are caught and sold annually now, though the long central trench was filled up and the experiment of rearing fish in the paddy fields discontinued after three seasons, in 1936.

The following varieties of fish were found to thrive well in the fish pond of which *Valai* or fresh water shark *(Callichrous bimoculatus)* alone was not found to live in paddy fields. It requires deep water to thrive.

	Tamil Name	*Scientific Name*	*Remarks*
1.	Valai	*Callichrous bimoculatus* (Bloch)	
2.	Viral	*Ophiocephalus striatus* (Bloch)	
3.	Sani Kandai	*Barbuis pennauratus* Day	Carp
4.	Sel Kandai	*Lebec fimbiatus* (Bloch)	Carp
5.	Venkandai	*Cirhinus cirrhosus* (Bloch)	Carp
6.	Kilathi	*Aoria Vittala* (Bloch)	
7.	Uluvai	*Glossogobius ginis* (H. B.)	
8.	Theli	*Hoteropneustez fossilis* (Bloch)	
9.	Arai—(Fe.)	*Rhyncobdella aculiata* (Bloch)	
10.	Pana-Eychi Kandai	*Anabas testudineus* (Bloch)	Carp
11.	Rattu—(Prawn)	*Pataemon*	
12.	Koravai	*Ophiocephalus punctalus* (Bloch)	

It would be seen from the list that not only carp but other fish mostly predacious in nature also get into the paddy fields and finally into the fish pond when fish are allowed free entry into the fields from rivers and channels. If carp alone are to be reared, artificial rearing of the carp fry will have to be undertaken for liberation into the paddy fields during the irrigation season, to the exclusion of all other kind.

The writer has not noted any one of the carps breeding in still water in the paddy fields but large numbers of their young fry are seen in the channel and river water, thereby showing that breeding of these carps takes place only in running water. *Ophiocephalus striatus* and *Ophiocephalus punctalus,* were found to breed freely in paddy fields from the months of September to November. About 10,000 eggs are laid on a circular raft made by sticking together cut leaves of paddy and grasses. The young of *Ophiocephalus striatus* are blood red in colour and when the young fry move in water the trail looks bloody; 3000 to 4000 young ones are noted in one brood. Of the carps, *Labeo fimbiatus* attains the biggest size. A full grown specimen would weigh a pound while others vary in weight from 3 to 8 ounces when full grown. None of these carps attain their full size within the 8 months of the paddy season as none of them weighed more than 4 oz. during the time. So it is essential that the immature fish should be carried over through the summer to the second season in a fish pond if the maximum size or weight of the fish is to be obtained.

A fresh fish pond was dug on the station and stocked with *Gourami* fingerlings in April, 1940. These were fed on groundnut cake and when specimens were caught at the end of two years, many of them had attained 5 lb. in weight. These fish have spawned freely in the pond which is 8 feet in depth and more than 500 young fry are now available. It is proposed to liberate 100 fingerlings of this famous fresh water carp in the paddy fields next paddy season taking suitable precautions to note what size they attain within 8 months of the irrigation season in comparison with the growth of the indigenous carps mentioned above.

There is no doubt that it is practicable to rear fish in the paddy fields of the Cauvery delta provided the cultivators take care to provide small fish

ponds of, say, 5 cents in area in 10 acre blocks of paddy fields to carry immature fish through the summer from one paddy season to the next so that fish could attain their maximum size and weight. Carp fry alone should be encouraged to grow in the paddy fields by excluding all the predacious fish. If exotic varieties of carp, like *Osphronienus gourami*, are able to thrive in paddy fields, the yield of fish in paddy fields could be greatly increased. An average catch of 50 lb. of fish from an acre will indeed, represent a great addition to the supply of food in the country, particularly so when it is a first class source of animal protein.

Dehydrated Banana Products and Their Food Value

By K. C. NAIK, B. Ag. (Bom.), M. Sc. (Bristol),
Fruit Specialist, Kodur (Cuddapah Dt.)

Introduction According to a recent estimate by the Provincial Marketing Officer, Madras, bananas are grown in the province on an area of nearly 140,000 acres. The estimated annual production of fresh banana fruits is of the order of 1,133,000 tons. Of these, *Poovan* accounts for more than half with an annual production of 741,000 tons. *Monthan, Nendran, Kunnan*, Mauritius, *Rasthali, Pachanadan*, Hill bananas and *Chakerakeli* follow next in order of importance, the first two claiming a production of nearly 90,000 tons each per year.

The pre-war exports outside the producing districts were over 910,000 railway maunds, of which the district of Trichinopoly claimed roughly 529,000 maunds, East Godavari, West Godavari and Madura 100,000 maunds each, and the districts of Salem and South Arcot about 70,000 maunds each. The exports by rail outside the province ranged from 80,000 to 90,000 railway maunds, mainly from the Cauvery area to the Mysore State and from 60,000 to 120,000 railway maunds from the Godavari area to the Nizam's Dominions and North India. In effect, the pre-war exports of 140,000 to 210,000 railway maunds may be taken to represent the annual surplus of fresh banana fruits in the province.

Provided the transportation facilities are improved and the demand for Madras bananas is fostered within and outside the province, there is much scope for extending the banana cultivation particularly in the heavy rainfall tracts of Malabar and on the hills of the Madura District where the crop can be raised under rainfed conditions. Such an extension seems desirable as the yield of bananas per acre surpasses that of the staple food crops, and the fresh ripe banana is recognized to be a very valuable and delicious food.

Restrictions in transportation facilities during the war may hinder the course of development of banana-growing industry in certain producing areas, and consequently, gluts in some producing regions and scarcity in others may become the features during the present emergency period. Dehydration of banana suggests itself as a means to tide over such temporary difficulties. The dehydrated bananas can, moreover, be transported

more cheaply and conveniently, and they may also help to alleviate the food scarcity to some extent.

The value of banana flour as a food has long been known in some parts of the province. The preparation of banana meal by sun-drying has, therefore, been practised as a cottage industry in the West Coast and in the districts of Tanjore and Trichinopoly. Realising its importance as an auxiliary food during the present times, the Government of Travancore are levying a customs duty of five per cent on banana flour of all grades and varieties exported from that State and have further restricted the export. The Foodstuffs Directorate, New Delhi, are also interested in finding out a source of supply of dried bananas for the use of the defence forces.

Preparation of banana figs by sun-drying has been attempted previously by the Agricultural Department at Aduthurai, Coimbatore and elsewhere, but the quantity produced was small and the popularity of the product was limited owing to its poor keeping quality. Although sun-drying is a simple operation, bananas dried by this method often produce a product which is dirty and mixed with insect eggs. On the other hand, dehydration, by which the moisture is removed by artificial heat in specially prepared chambers, and where temperature and, if possible, humidity and rate of flow of air can be regulated, renders the product free of dust and insect eggs. Furthermore, the risks of damage by rains, storms or cloudy weather are eliminated and a more uniform and superior quality product is claimed by dehydration.

Methods of preparing fig and flour Experiments on the preparation of banana figs and flour dehydration of a large number of varieties were conducted at the Fruit Research Station, Kodur, during 1942-43. The methods employed are briefly described below.

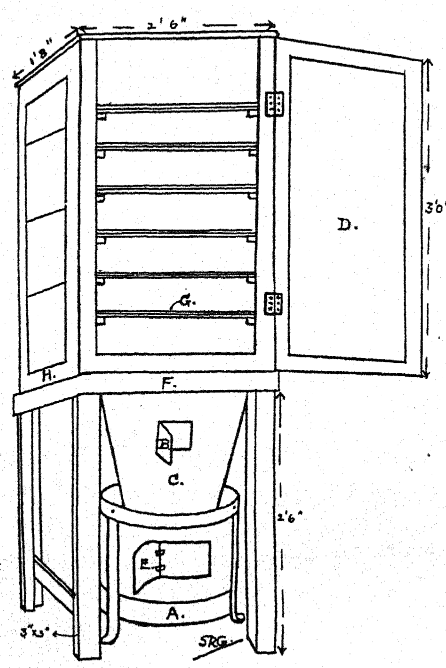
For preparing banana flour, fully matured but slightly unripe bananas were taken and dipped in boiling water for 2 to 3 minutes to facilitate peeling. In some trials, however, ripe fruits were also utilised. After removing the peel by hands, covered with rubber gloves, the pulp was cut into halves or quarters, lengthwise. The slices were then spread on single layers on slat bottom bamboo trays. The trays were then stacked either inside the 'home drier' or in a specially constructed room. The air inside the room or the chamber was heated by means of a charcoal oven or a fire place. By adjusting the ventilators the temperature inside the chamber was maintained at 145°F. to 150°F., while inside the room the temperature ranged from 135°F. to 138°F. When the slices were dry they were removed from the trays, powdered and sifted, and finally stored.

In order to obtain a more attractive and whiter flour, the slices in some of the trials were exposed to the fumes of burning sulphur for 20 minutes before drying.

For the preparation of banana figs the same process as outlined above was adopted except that the slices after dehydration were cut into small pieces and stored as such.

Home drier - its construction and working A small 'home drier' used in these experiments costs about Rs 60 and can easily be constructed by an ordinary village artisan. It is a box (Plate I) 3ft × 1ft. 8in. × 2ft. 6in. resting on a wooden stand 2ft. 6in. high. An iron sheet forms the bottom of the box or chamber. The inside of the door and the portion against which it clings when the chamber is closed are lined with asbestos. The box is provided with two longitudinal openings on the top, each 12 in. long × 1 in. broad for the escape of moisture from inside the box. Another small aperture is provided on the side opposite to the door, to take in a thermometer. The chamber has space for fitting seven trays with bamboo slat bottoms. These trays can be stacked in a staggering manner to allow free circulation of hot air.

PLATE I



The source of heat for the chamber is a charcoal oven which is placed on the ground below the centre of the iron sheet bottom of the chamber. The oven is divided into three sections, the top one for piling up charcoal and for ignition, the central one with a perforated bottom for stoking and for facilitating the removal of ash through the perforated bottom, and the bottom section for collecting the ash. The central section has got two doors or ventilators provided with collapsible shutters. They permit stoking the fire and help to a certain extent to regulate the intensity of the heat.

The oven is fitted up with a chimney which touches the iron sheet bottom of the chamber. This funnel is provided with two windows opposite to each other, and these are with collapsible metallic doors. These help in feeding the oven with charcoal from time to time and also in regulating the heat to some extent. The temperature inside the chamber can be further regulated by opening or closing the door of the chamber.

The chamber maintains a temperature of 145°F. to 150°F. when fully charged. To ensure uniformity in the rate of dehydration, it is necessary to alter the positions of trays by shifting those at the bottom to the top and *vice versa* two or three times in the course of dehydration. The drier has a capacity of dehydrating 30 to 40 lb. of pulp at a time.

Dehydration in a room The dehydration room is constructed of bricks and is 8 ft. long, 7 ft. broad, and 8 ft. 6 in. high at the centre. The roof is

made of galvanised iron sheets. The single door is 6 ft. 6 in. × 3 ft. 6 in. and is of ordinary country wood. On each of the two side walls are fitted wooden struts over which the bamboo slat bottomed trays can be stacked in layers with the help of a few bamboo sticks. Opposite the door

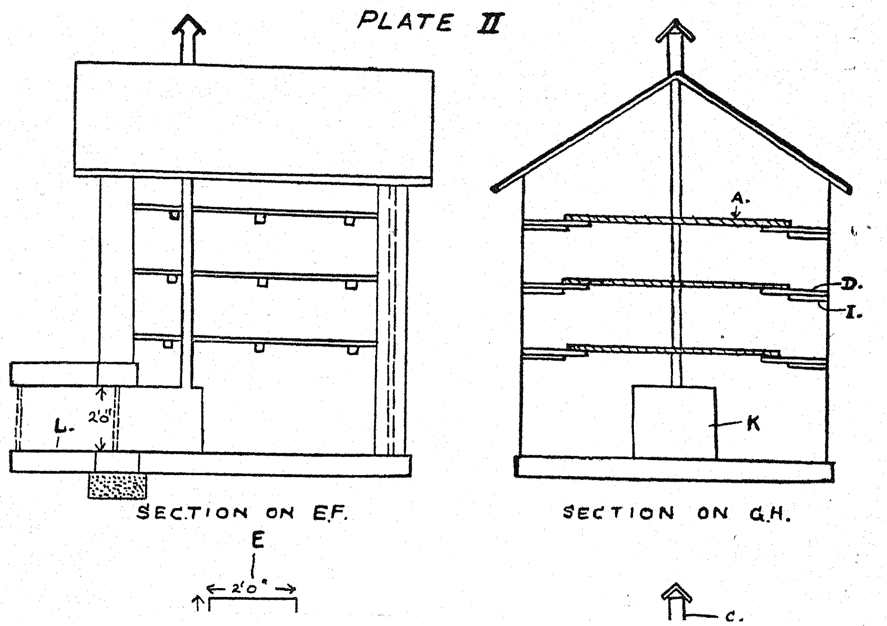
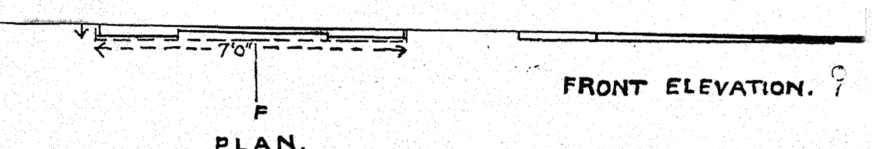


Plate I. Home Drier.

A. Charcoal oven, B. Ventilator of the chimney. C. Galvanised iron or tin chimney, D. Door of the dehydrater, E. Ventilator of the oven, F. Stand to mount the dehydrater. G. Wooden tray, H. Body of the dehydrater.

Plate II. Dehydration Room.



a fire place is built opening to the outside. The fuel consisting of any trash, prunings or dried leaves is ignited through the fire place from outside. The fireplace is closed by a galvanised iron drum from the inside of the room and this serves to radiate the heat. A galvanised iron chimney of

4 in. diameter is built inside the room over the iron drum of the fireplace and rises up above the roof.

When fully charged the room has a temperature range of 135°F. to 138°F. As in the chamber, a slight shifting of the trays is necessary inside the room also to ensure uniformity of dehydration. The room is estimated to cost Rs. 150 to Rs. 200 for construction. It can take about 250 lb. pulp at a time.

Tunnel dehydrater Although the above methods were the only ones used at Kodur, it is possible to dehydrate bananas on a large scale with the help of tunnel dehydraters. These are heated by steam or flue pipes and hot air is forced by means of high velocity fans. The quality of the product dehydrated in this manner is stated to be unsurpassed. The short drying time possible in this is a great advantage. It is reported that in West Indies attempts have also been made to prepare flour from banana pulp by means of drums and vacuum driers. At Kodur, however the 'home drier' and the 'dehydration chamber' have been found to be quite suitable for the purpose.

Results of preparation of Banana figs and flour In all 29 varieties of bananas produced at Coimbatore, Anakapalle, Maruteru, Lower Palni, Tellichery and Kodur were utilised for trials on the preparation of banana figs and flour. The trials were conducted at different periods. It was not possible to adopt a uniform standard of fruit maturity at the commencement of each trial in respect of each variety. Both the 'home drier' and the 'dehydration chamber' do not also lend themselves for regulation of temperature with a high degree of precision. The results obtained, therefore, have to be examined in the above background.

Banana figs Exposing the slices to sulphur fumes for about 20 minutes helps to improve the colour of the final product, rendering it more attractive than the figs prepared from unsulphured fruits. Among the varieties tried the best quality fig was obtained from *Pey Kunnan* variety. *Nendrapadathi* and *Ney Poovan* figs were also good. According to the Processed Food Stuffs Directorate, figs of *Kapur* and *Nendran* were not up to the mark as they absorbed moisture in storage. The percentage of recovery as figs on the basis of fresh fruit weight was highest in *Pey Kunnan*, namely 34·7. In the case of *Ney Poovan* it was 32·0 while in the case of *Nendra Padathi* it was only 20·6.

Ripe fruit does not seem to be well suited for the preparation of figs. In general, the product from such fruits even after sulphuring becomes dark in storage. The flavour of fig from *Pey Kunnan* ripe fruits was definitely poor.

Among the varieties tried, *Bontha Ashy*, *Bontha Green* and *Virupakshi* took the least time for dehydration, possibly owing to their solid flesh and low moisture content. At a temperature of 145° to 150°F. these varieties were completely dehydrated in 9 to 10 hours as against 15 to 22 hours taken by other varieties.

Banana flour In the case of flour also, sulphuring the slices gives a far superior product. Flour from ripe fruit is definitely of a better taste and

sweetness than that from unripe fruit. Flour from ripe fruit of *Virupakshi, Pey Kunnan* and *Karpura Chakkarakeli* is of a very good quality and is suited for making delicious beverages in no way inferior in flavour to such well-known proprietory products as Ovaltine, etc.

It is, however, much easier to prepare flour from unripe bananas. Such fruits take less period for dehydration and are easily converted into flour after dehydration. Fully mature fruits of certain varieties like *Karpura Chakkarakeli* develop their characteristic ripe peel colour within about an hour of stacking the slices inside the 'dehydration chamber'.

Like the ripe fruits, unripe fruits of *Virupakshi, Bontha Green* and *Bontha Ashy* could be dehydrated more quickly than other varieties. *Kareem Kadali*, though it dehydrates quickly cannot be as easily peeled by dipping in warm water as the rest of the bananas.

Wide differences were exhibited by varieties in regard to the percentage of recovery as flour. *Nendran*, in spite of its thick peel produced the highest recovery, namely 27·6 and is, therefore, considered to be most economical for flour manufacture. *Pey Kunnan*, with a recovery of 21·2 per cent, *Bontha Ashy* with 21·6 per cent, *Bontha Green* with 20·4 per cent, *Kareem Kadali* with 21·9 per cent and *Ney Poovan* with 22·8 per cent are other suitable varieties from the above point of view. Varieties which gave low recovery of flour are *Karpura Chakkarakeli*, Mauritius and *Pedda pacha arati*, with percentages below 15. The bananas as a whole compare favourably with guavas, in which fruit the recovery of flour was only 12 per cent of the fresh fruit weight.

Banana Figs—Vitamin C values The Director, Nutrition Research, Coonoor, kindly undertook to assay the vitamin C contents of ten samples of figs dehydrated with and without sulphuring. The values are given in Table I.

TABLE I The vitamin C values of banana figs

Serial No.	Variety	Vitamin C—mg. per 100 gm.	
		Sulphured	Non-sulphured
1	*Chinali*	11·25	12·50
2	*Pey Kunnan*	15·00	12·50
3	*Karpur*	12·50	15·00
4	*Kunnan*	13·75	18·75
5	*Nendra Padathi*	18·75	16·25
6	*Ney Poovan*	10·00	7·50
7	*Rasthali*	11·25	15·00
8	*Kali*	11·25	10·00
9	Mauritius	13·75	16·25
10	*Pedda Pacha Arati*	17·50	18·75

It will be observed that the vitamin C content of figs is low. As a source of vitamin C banana figs do not, therefore, seem to be important. The effect of sulphuring seems unimportant. *Nendra Padathi* and *Pedda Pacha Arati* are the two varieties which have shown somewhat higher values of vitamin C than the others.

It may be interesting to compare the above values with those obtained from dehydrated guava flour, data for which are presented below.

TABLE II The vitamin C values of guava flour

Variety	Vitamin C—mg. per 100 gm.
Saharanpur Seedless	310
Allahabad	580
Guava No. 46	490
Smooth Green	280
Red Fleshed	450
Nagpur Seedless	450

Guavas, therefore, are by far a richer source of vitamin C than dehydrated banana figs.

Chemical Analysis *Banana Figs* The chemical analysis of figs from six varieties of unripe bananas was done at Coimbatore by the Government Agricultural Chemist and the results are given in Table III.

TABLE III Showing the chemical analysis of banana figs

Item No.	Head of analysis	*Pey kunnan*	*Nendra padathi*	*Karpura chakkara-keli*	*Kunnan*	*Ney poovan*	*Then kunnan*
1	Moisture	9·19	9·40	9·63	10·69	7·89	8·94
2	Ash	2·58	3·20	3·03	2 29	2·26	2·18
3	Crude proteins	2·89	3·88	3·68	3 00	2·75	3·22
4	Reducing sugars	49 89	44·20	59·12	52·71	48·12	24·47
5	Non-reducing sugars	4·54	7·12	2·14	4·56	3·01	15·20
6	Carbohydrates, fat, fibre etc. (by difference)	30·91	32·20	22·40	26·75	35 97	45·99
	Total	100·00	100 00	100·00	100·00	100·00	100·00
7	Insoluble matter	0·027	0·061	0·057	0·025	0·056	0·040
8	Lime (CaO)	0 052	0·048	0·055	0 055	0·039	0·045
9	Phosphoric acid (P_2O_5)	0·18	0·21	0·28	0·17	0·18	0·26
10	Nitrogen (N)	0·46	0·62	0 59	0·48	0·44	0·51

According to the Government Agricultural Chemist, the figs are a sustaining food, rich in reducing sugars and other carbohydrates and contain fair quantities of protein and minerals.

Banana flour The results of chemical analysis of banana flour as carried out at Coimbatore and Coonoor are given in Tables IV and V.

In both cases corresponding values for a few other staple foods are also presented for comparison.

TABLE IV Results of analysis done at the Nutrition Research Laboratories, Coonoor—Banana flour

No.	Head of analysis	*Karpura chakkara-keli* flour from ripe fruit	*Bontha Ashy* flour from unripe fruit	Mauritious flour from unripe fruit	Arrow root flour (West Indian)	Tapioca	Potato	Goa potato
1	Moisture	9·81	12·42	11·11	16·5	59·4	74·7	74·87
2	Protein	4·58	3·37	4·92	0·2	0·7	1·6	2·46
3	Fat (Ether extractives)	1·72	0·49	0 19	0·1	0·2	0·1	0·21
4	Mineral matter	2·35	1·66	2 61	0·1	1·0	0·6	1·06
5	Carbohydrates	81 54	82·06	81 17	83 1	38 7	22 9	21·40
6	Calcium (Ca)	0·035	0 017	0·017	0 01	0·05	0·01	0·006
7	Phosphorus (P)	0·042	0 019	0·033	0·02	0 04	0·03	0·013
8	Iron (Fe)	4·3	3 0	4 8	1·0	0·9	0·7	1·4
9	Calorific value per 100 gm.	360	346	346	334	159	99	97

TABLE V

Results of analysis done at the Agricultural College and Research Institute, Coimbatore, of flour from unripe fruits

Head of analysis	*Karpura chakkarakeli*	*Bontha Ashy*	Mauritius	*Pedda pacha arati*	*Ney poovan*	*Bathees bontha ashy*	*Bathees bontha green*	*Bontha green*	*Nendran*	*Nalla chakkarakeli*	*Mala vazhai*	*Nendra padathi*	*Karun kadali*	Mean for banana	Rice	Wheat	Potato	Tapioca
Moisture	8·03	8·99	7·25	7·83	7·30	7·46	8·25	7·85	7·83	7·13	7·11	7·73	7·58	—	—	—	—	—
Ash	3·29	2·31	3·45	3·93	2·71	2·92	4·58	2·98	2·98	3·52	3·18	2·91	3·24	3·50	1·02	2·56	4·03	2·06
Crude protein	3·32	3·04	3·49	6·44	2·88	3·47	5·74	3·29	3·15	4·92	3·16	3·72	5·86	4·38	7·73	18·74	9·76	5·00
Crude fibre	1·03	0·95	0·56	0·57	0·59	0·84	2·33	1·15	0·73	0·79	0·85	0·75	0·78	1·00	0·46	1·69	2·74	1·62
Ether extractives	0·81	0·49	0·48	0·69	0·66	0·51	0·76	0·40	0·48	0·59	0·62	0·62	0·53	0·64	0·84	2·69	0·57	0·27
Carbohydrates (by difference)	83·52	84·22	84·77	80·54	85·86	84·80	78·34	84·83	84·33	83·05	85·08	84·27	82·01	90·48	89·95	74·32	82·90	91·05
Insolubles	0·122	0·014	0·039	0·098	0·008	0·057	0·086	0·034	0·020	0·032	0·072	0·079	0·031	—	—	—	—	—
Lime (CaO)	0·062	0·037	0·040	0·046	0·056	0·036	0·090	0·038	0·048	0·041	0·059	0·053	0·038	0 05	0·03	0·13	0·13	0·15
Phosphoric acid (P_2O_5)	0·373	0·218	0·236	0·208	0·225	0·390	0·517	0·382	0·282	0·306	0·240	0·242	0·194	0·33	0·46	1·21	0·54	0·22

The Director, Nutrition Research, Coonoor, has inferred that banana flour both from the ripe and unripe fruit containing as it does some 3·4 to 5·0 per cent of protein, is by no means a poor source of this food factor. Its calorific value is good and it is also not a negligible source of minerals. Further, it contains some vitamin B_1. He, thererefore concludes that banana flour is superior to arrowroot flour and also to tapioca, allowing for the difference in moisture content. He suggests that banana flour production should be encouraged particularly as a food for young children. The flour is quite palatable and its sweetish taste would probably appeal to children.*

On the other hand, the Government Agricultural Chemist, Coimbatore infers that the varieties differ with wide limits in nutritive value, flour from unripe *Bathees Bontha Green* being specially mentioned by him as being rich in protein as well as minerals. On comparing the average analysis of 13 varieties of flour from unripe fruits with rice, wheat, potato and tapioca he infers, that banana flour from unripe fruits, though a useful food, cannot stand a comparison with other foods except tapioca, in protein and mineral contents.

In the case of banana figs the reducing as well as total sugars are slightly higher than in the case of flours from the corresponding varieties of bananas. The mineral contents of the flour and figs for any of the varieties analysed are not significantly different.

Although banana flour cannot stand comparison with such staple foods as wheat, rice or potato in its protein and mineral contents, it possesses certain valuable auxiliary food factors such as vitamin B_1 and vitamin C, and also available iron to a fair degree. It is these factors and not the protein content alone that have led certain authorities to recommend the production of dehydrated banana products as childrens' food. While banana flour may not replace staple food like rice or wheat, it should certainly help as a valuable substitute for the staple foods in times of scarcity. There is no doubt that it deserves popularization in preference to tapioca and arrowroot flours.

In regard to the food value of banana flour a writer in a Jamaican Journal (*The Journal of the Jamaican Agricultural Society, September 1941, page 334*) asserts that it is superior in carbohydrates to wheat flour but inferior in protein or flesh-forming values, very palatable and particularly adapted to persons of weak digestion organs. He refers to cases of patients who were unable to keep down milk or other foods, but easily kept down banana flour made into a thin gruel and flavoured with lemon or lime juice and sweetened with sugar. He adds that the starch in it is particularly easy of solution and digestion in the alkaline juices of the body. Banana meal is also reported by him to be used with safety by persons who do not want to put on flesh but wish to be fit and strong.

* It is being used as food for children in some parts of this province.—*Ed.*

Use of banana flour and fig Attempts have been made to work out methods of preparing from the banana flour and fig a large number of appetising dishes and beverages. The results of these attempts have disclosed numerous possibilities which remain yet to be fully exploited. A number of recipes which have already been tested are being published in the form of a Departmental Leaflet.

Acknowledgment Sri C. Bhujanga Rao, First Assistant, Fruit Research Station, Kodur, has assisted the author in the conduct of some of the investigations reported in this paper. The Director, Nutrition Research, Coonoor, and the Government Agricultural Chemist, Coimbatore, were responsible for carrying out the vitamin tests and chemical analyses Dr. G. S. Siddappa, Bio-Chemist, Kodur, has taken the trouble of reading through the manuscript and suggesting improvements in the text. To all these the author's grateful thanks are due.

Effect of Seed Treatments on the Germination of Paddy

By J. C. SAHA

Botany Department, Rajshahi College, Rajshahi (Bengal)

That the cultivation of paddy suffers, often considerably, from the attack of various diseases is well known in India and elsewhere. Attempts are therefore made to prevent or control their damage through various means, viz., through propagation of more resistant varieties, seed treatment, or spraying (or dusting) the standing crop with fungicides. Seed treatment being a cheap and easy method, is within the reach of common cultivators, who, being proverbially poor, are unable to pay for the cost of fungicides and the spraying outfits apart from the question of labour that is necessary to spray large areas. Further, the quantity of fungicide that would be required for seed treatment is infinitesimally small in comparison with the quantity that would be required for spraying fields grown out of the same quantity of seeds. From these considerations agricultural workers are now paying more attention to develop seed treatment as a practical means to combat the diseases. Attempts have, therefore, been made in the present investigation to ascertain whether the chemicals used for treatment have got any detrimental effect on the germination of seeds and, if so, to modify the seed rate in sowing accordingly.

Transplanted *Aman*, var. Chinsura 72, was selected for the purpose. Seed treatments* were done with the following chemicals, that are commonly used in Bengal:—

A—Agrosan G

B—Bordeaux mixture, 1% for 10 minutes

C—Copper sulphate solution, 2% for 30 minutes

D - Formalin (aqueous) solution, 2% for 15 minutes

* The seeds were treated 24 hours ahead of sowing and the lots that were treated with liquid fungicides were dried in the sun after the period of treatment was over.

E—Mercuric chloride solution, 2% for 5 minutes
F—Potassium permanganate solution, 5% for 15 minutes
G—Sulphur dust
H—Water (control)

The experiment was laid out in 15 randomized blocks, each having eight unit plots corresponding to the eight different seed treatments. Only 100 seeds from each treated lot were sown per unit plot. The percentage of germination was calculated on the number of seedlings that come above the soil level. The analysis of variance of the data obtained shows that the seed treatments are significant in their action at 1 per cent level.

Effect of seed treatments on germination of paddy (Summary of results)

	Seed treatments								Standard
	E	A	F	G	H	B	C	D	Error
Average percentage of germination	99 0	98·7	97·6	97·0	97·0	89 3	89·3	87 0	1·34

From the summary of the results given above it will be seen that different treatments have different effects on germination. B (Bordeaux mixture, 1 % for 10 mins.), C (copper sulphate sol., 2 % for 30 mins) and D (formalin—aqueous sol., 2 % for 15 mins.) significantly lower the percentage of germination to the extent of 9 to 10 per cent, while the rest of the treatments have no such inhibitory effect. In fact E (mercuric chloride sol., 2 % for 5 mins.) and A (Agrosan G.) increased the rate of germination by 2 and 1 per cent respectively. But these increases in germination percentage are not statistically significant.

Therefore, when any of the above three chemicals, viz., Bordeaux mixture, copper sulphate solution and formalin are used in seed sterilization the seed rate in sowing should accordingly be increased by 10 per cent.

SELECTED ARTICLES

Improved Breeding for Milk Production

By JOHN HAMMOND, M. A., D. Sc., F. R. S.,
School of Agriculture, Cambridge

In travelling round the countryside to-day one is struck by the vast improvement made in the state of cultivation and in the production of crops during the war. No such improvement has occurred in live stock, however, but most people will probably agree that the time has now come for this to be taken in hand. A widespread movement for the improved breeding of dairy cattle is required, not only for increased production in war time but also to enable the dairy farmer to hold his own successfully after the war. There is every indication that there will be a world shortage of animal products in the immediate post-war years, and we should be prepared to meet this situation. At the present time, and immediately after the war, when supplies of animal feeding stuffs will be difficult to obtain, it is important that the best use should be made of those that are available.

Economy of Production The dairy cow is the most economical animal converter of feeding stuffs into human food. For every 100 parts of protein or starch in the feeding stuffs, the dairy cow produces 20 parts for human food as milk, as compared with only 8 parts as meat by the beef steer. This is one of the reasons for giving the dairy cow priority in the supplies of feeding stuffs.

Individual cows, however vary greatly in their efficiency, and one of our major problems to-day is that of breeding cows with a high efficiency in milk production. High yielding cows are more efficient in the conversion of feeding stuffs into milk than are low yielding cows. The reason for this is that part of the ration of the cow is required for maintenance, that is, to keep the cow alive, before the rest of the ration is used for milk production. A cow producing only 320 gal. per year will use 56 per cent of her ration for maintenance, and only 44 per cent for milk production; on the other hand, a cow producing 850 gal. will use only 35 per cent of her ration for maintenance, but 65 per cent for production. It is obvious, therefore, that by using cows of high productive level we are increasing the economy of production. It is little good to take a lot of trouble in growing oats and other feeding stuffs if we are going to waste them by feeding to low producing cows. The average yield of dairy cows in this country is only about 480 gal. a year, but with improved breeding methods on a large scale there is no reason why it should not be materially increased in the course of a few years.

The practical means by which the improved breeding of dairy cattle can be brought about may be divided into two parts:

(a) the breeding of dairy bulls which will transmit high milk producing capacity *with a high degree of certainty*;

(b) the means by which the commercial milk producer can grade up his herd by the use of such bulls.

Let us consider each of these two problems in turn.

Breeding bulls to transmit high milk yields The Dutch breeders have been among the most successful in this sphere, and the secret of the method they use is that of knowing for certain the breeding qualities of the bull before they breed young bulls from him; that is, breeding their young bulls from "progeny tested" bulls only. Here, for example, is a typical pedigree of one of their bulls:

Sire: Athleet ×	Dam: Gerard Bertha	Sire: Athleet ×	Dam: Grietje 39,223
(6 daughters)	(7 lact. Av.)	(6 daughters)	(5 lact. Av.)
(Av. 11, 367 lb.)	(11,235 lb. 3·67%)	(Av. 11,367 lb.)	(8,922 lb. 3·86%)

Sire: Bertus 16,877 × Dam: Grietje 73,078

(6 daughters—Av. 11,000 lb.) (4 lact. Av.—13,596 lb. 4·6%)

Bertus 19,517

All the bulls mentioned in this pedigree are 'proven bulls', that is, they are bulls whose daughters had averaged a high level of production. By using a succession of such 'proven bulls' in the herd, it is possible to breed bulls which will transmit high production with a *high degree of certainty*.

Owing to the destruction caused by the war, we shall probably be unable to import more Dutch bulls into the country for some time: we can, however, with great advantage import Dutch methods of breeding for milk and use these methods on all our breeds of dairy cattle.

There is a tendency among some pedigree bull breeders to over stress the value of the dam's production and to pay insufficient attention to the *bull's capability of transmitting milk*. For example suppose one were breeding for red colour in Shorthorns and knew only the colour of the dam and not that of the sire, the chances are that there would be a large number of throw-outs of roans in a herd bred in such a way, even if the cows were selected carefully for red. It is just the same with breeding for milk; you must know the sire's

capacity for milk as well as the dam's if you are to guarantee that the offspring will breed true. It is not enough to say of a bull that his sire's dam had milk, for his sire had a sire as well as a dam, and he may hand down poor milking qualities.

War Agricultural Executive Committees are now establishing registers of approved pedigree and milk recorded herds in their areas for increasing the supply of well bred young bulls for distribution to commercial herds. Provided the sire is well bred for milk there should be no reason why bulls for commercial herds shou'd not be obtained from 'grading-up' cows of high producing capacity.

It is hoped that owners of pedigree, 'grading up' and milk recorded herds will co-operate on these lines in providing a source of supply of bulls for commercial producers. At present a large number of valuable bull calves, well bred for milk, are being slaughtered because they are not wanted by other pedigree breeders. The pedigree breeders have not the facilities to rear all their bull calves and to sell them at profitable prices to commercial producers. It is the intention to overcome this difficulty, however, either by rearing the bull calves to breeding age on a war Agricultural Executive Committee's farm (if suitable facilities are available) before sale to the commercial dairy farmer, or by supplying week-old bull calves to the commercial dairy farmer to rear for himself. Since some pedigree breeders may hesitate to sell bull calves because bad conditions of rearing may discredit their stock, War Agricultural Executive Committees have been instructed, where necessary, to earmark these bull calves in a distinctive way, and distribute them to commercial dairy farmers without pedigree or the name of the herd from which they originated, records of these being kept in the Committee's files only.

Grading of herds by commercial milk producers While milk recording and the keeping of heifer calves for rearing from the best cows only is a good practice and one to be encouraged, it is slow, because of the limited number of offspring produced by a cow. A bull will produce on the average 35 calves in a year (and with artificial insemination up to 1,000 given great density of cow population), as compared with only one from a cow. Progress can therefore be made much more rapidly by concentrating attention on the bull used. (For the year ended January 1st, 1942 in the whole of the U. S. A. 111,451 cows were artificially inseminated from 408 bulls; in other words, 273 cows per bull. Ed.)

Whenever possible, it is better for the herd to rear its own replacements rather than to buy them in, not only because of the knowledge of how the animals are bred, but also because of the danger of introducing disease into the herd through purchased animals.

Dairy cattle should be bred pure or graded up to a pure breed. Cross breeding, except with the definite purpose of continuing 'grading-up' to the new breed introduced, should be strongly discouraged. Unlike the producer of beef cattle, which are all sold off for slaughter, the farmer who breeds cross-bred dairy heifers has to continue to breed from them, and unless the 'grading-up' is continued, a zoological collection of nondescript cows is soon obtained.

In each herd a careful consideration is required of the pure breed to which it should be graded up. In deciding this there are two main considerations: (1) the suitability of the soil, climate and environment of the holding for a particular breed; and (2) the purpose for which the herd is kept. For example, if the owner is a producer-retailer he will probably require a high butter-fat breed with good coloured milk, while if he is rearing and feeding his steer calves he will require a dual purpose type. If beef is the primary consideration, however, it would be better to use a beef bull of distinctive colour markings (Aberdeen Angus-black, or Hereford-white face), so that the heifer calves do not

get on the market under the guise of dairy-bred calves and, when purchased by some other dairy farmer, ruin his output of milk.

In dealing with a low producing herd of nondescript cows, there are some people who would probably say, " Fatten off and slaughter the lot", while, no doubt, a certain amount of weeding out and slaughter of old and diseased cows may with advantage be carried out. In the writer's opinion the present is not the time for the slaughter of even poor dairy stock on a large scale, for there is a shortage of cattle in Europe, and this country needs all the milk that can be produced. Rather, I believe, should we begin immediately to grade up these poor cows by the use of good bulls.

A good herd in two generations The rapidity with which 'grading up' to the high producing pure breed can be effected is probably not fully appreciated by those who have not seen it in practice. A low producing nondescript herd can in two generations be made into a herd of quite reasonably good production and type by 'grading up' with high producing, pure bred bulls. The movement for the better breeding of dairy cattle would be given a great impetus if all dairy cattle breed societies would institute a 'grading-up' herdbook, either with or without entry into their present herd book.

The small herd—one too small to justify keeping a well bred bull—is a problem in many areas. The purchase of bull calves should in most cases solve this problem, although an alternative, and perhaps more convenient and less costly means—by artificial insemination from a well bred dairy bull—is now under trial in the Reading and Cambridge districts.

In conclusion, it is evident that there is a need for the problem of breeding for milk production to be attacked on a broad community basis for the common good of dairy farmers—to prevent bad dairy cattle ever being born rather than merely to accept them as inevitable and push the bad ones off on somebody else, thus lowering the efficiency of the industry as a whole. *J. Min. Agri. Sept. 1943.*

Fruit Bottling

By Miss K. I. NOBLE,

Demonstrator, Ministry of Food, England.

Introduction Fruit bottling not so long ago, was regarded as a typical country occupation, but the war has made the town housewife equally "preserve minded" and, judging from the queries and general interest in this subject, even keener than her country sister who wisely bottles and preserves every year as a matter of course. To be successful, it is necessary to make sure that everything is done to avoid mistakes, and so whatever method is chosen should be followed carefully and the following points noted.

Objects The object of preserving fruit is to destroy bacteria, moulds, yeasts, and enzymes which would otherwise cause deterioration.

Methods The methods of doing this are by (1) sterilizer, (2) oven, (3) pulping, and (4) Campden method.

Water or Syrup Fruit can be bottled very successfully in plain water, although if sugar can be spared flavour is improved by using syrup, viz. ; 2—8 oz. sugar to each pint of water. Preparation of syrup: dissolve sugar in water and boil for a few minutes, strain. Note -syrup with honey: add two parts of water to one part of honey.

Preparation of fruit and jars Fruit should be fresh, dry, sound and firm. It should also be ripe, and whenever possible graded according to size and ripeness. The only exception is gooseberries, which should be bottled when green and hard. Cherries: the dark and red types are best for preserving, e. g., 'Morella'

and 'May Duke'. Apples and pears, when peeled, should be put straight into salt water (1½ oz. salt to 1 gallon water) to prevent discoloration, but not left long before being sterilized.* They could alternatively be (a) steamed for five minutes, or (b) blanched for three minutes. Currants, black, red or white: stalks should be removed, also blossom ends if very large, and then rinsed in cold water. Soft fruit are hulled and shaken well down in the bottles. Raspberries in syrup are fruit which are inclined to rise; to overcome this fill bottle 1/3rd full of fruit, then cover with liquid and continue alternatively until bottle is full. Stone fruit, e. g., cherries and plums: pack tightly without crushing, using the handle of a wooden spoon, to the top of the jar. Jars or bottles must be washed and rinsed, also examined carefully for flaws or other damage, particularly round lip. Wash and thoroughly dry lids and rubber bands; the latter should be carefully examined and discarded if they show signs of perishing; they should fit easily and, if in good condition, go back to their original size when gently stretched.

Sterilizing under water Soak rubber rings in warm water before use. If no special sterilizer is available, use a large deep saucepan, fish kettle, boiler or pail. The receptacle should be deep enough for water to cover the jars when they are placed on a wire or wooden rack, or on several thicknesses of cloth or paper (to guard them from direct heat). If it is not possible to cover the jars completely, the water should reach well up to the shoulders. Cover the receptacle to prevent evaporation. Any of the following jars are suitable for this method: (1) bottling jar with glass top, rubber ring and metal screw band (2) bottling jar with metal top, rubber ring and clip; (3) standard 1 lb. or 2 lb. jam jar with rubber ring, lid closure and clip. METHOD: (1) Prepare fruit as described and pack into jar. (2) Fill to top with fresh cold water or syrup if used. (3) Screw top jar—Place rubber ring and glass top in position and screw down metal closure. Now unscrew by one half turn so that it is loosely closed but will allow steam to escape. Clip top jar--Place rubber ring and metal top in position on jar and secure with clip. Standard jam jar, with metal closure—Fit with rubber ring on to sloping edge of lid. Place this on jar and slide the clip on so that it holds firmly in position. The clips, being pliable, should be bent at a more acute angle if necessary to grip well. (4) Place the jars in sterilizer or receptacle, fill with cold water and cover with lid. (5) Heat slowly until temperature reaches 165°F., taking 1½ hours to do so (if no thermometer is available, heat to a slow simmering temperature), and maintain this heat for 10—20 minutes—degree of heat and time maintained depends on the type of fruit. The following Ministry of Agriculture table is a good guide (Leaflet No. 11, Dig for Victory).

	Temperature to be reached in 1½ hours (in degrees F.)	Maintain for (Minutes)
Apples (solid pack)	175	10
Apples (in syrup), Apricots, Blackberries, Damsons, Gooseberries, Greengages, Loganberries, Mulberries, Peaches, Plums (ripe whole), Raspberries, Rhubarb, Strawberries	165	10
Plums (halved or unripe)	165	20
Currants	180	15
Pears	190	20
Cherries	190	10
Quinces	190	20
Tomatoes	190	30

(6) After sterilization remove jars, place on wooden board or table and (a) tighten

* Pears—Only ripe dessert pears should be treated in the manner described here. Cooking pears should be stewed until tender before bottling.

screw band immediately, and again after a few minutes, then leave till the next day; (b) leave clip top bottles as closing action with these is automatic.

Testing the seal Remove the screw band or clip and lift the bottles by the lids. If seal is perfect, lids will remain in position. If lid comes off, the seal is imperfect and fruit should be re-sterilized, if necessary in another jar as imperfections are often responsible for imperfect sterilization, or it can be used quickly.

Oven method This method is popular because it is quick and simple and, if fruit shrinks to any extent, one jar can easily be filled up from another, replacing in the oven for a further five minutes to complete sterilization. The main points are (1) Prepare fruit and pack as for sterilizer method. (2) Do not add water or liquid. (3) Cover each jar with glass top, patty pan or other lid to prevent top fruit from being overheated. Do not put on the rubber rings in oven, or clips or screw bands. (4) Place on asbestos mats or baking sheet in a slow oven (250°F or Regulo ½—1) and heat until the fruit appears cooked and juice begins to run (¾ to 1 hour—tomatoes 1½ hours). (5) Fill up jars if necessary and replace in oven for 5–10 minutes. (6) Have ready fast boiling water or syrup. Remove one jar at a time from the oven, place on a wooden board or table, fill to overflowing with boiling liquid and cover immediately. Tighten screw if possible again as the jar cools. Test the seal the next day as in sterilizing method.

Pulping Pulping is a useful method when fruit is plentiful; rather over ripe fruit may be used. If storage space is limited, this way can be used and the pulp later made into jam or used for puddings. Fruit is stewed with very little water (tomatoes do not require any, but allow ¼ oz salt to every 2 lb.). When cooked, and while still boiling hot, pour at once into hot sterilized jars, seal immediately as when bottling and sterilize by placing in a pan of hot water (standing them on a fake bottom) and boil for five minutes. Tomato pulp requires fifteen minutes sterilization. Note—If fruit is sieved (in which case tomatoes and apples, for example, need only be washed and cut up before stewing), the puree must be brought to the boil before pouring into hot jars and sterilized as above.

Campden method The Campden method is quite easy but is not recommended for gooseberries or currants as it tends to toughen the skins. Neither is it suitable for sweet fruits such as sweet cherries, dessert apples, pears, tomatoes and black berries. It should never be used for vegetables. The main points are (a) choose sound fruit (b) to each 1 lb. of fruit allow at least ½ pint of the solution (i.e., 1 Campden tablet crushed and dissolved in ½ pint tepid water), (c) the fruit must be completely covered with the solution, (d) the jars must be made airtight; metal tops should be protected with wax or greaseproof paper to prevent sulphur coming into contact with the metal. The fruit loses most of its colour but most of it should return on cooking. Before eating the fruit, it and the liquid, should be put in an open pan and stewed gently to drive off sulphur fumes for about 20-30 minutes, or until no taste of sulphur remains; then sweeten to taste and use as required for pies, stewed fruit, etc. Plums, rhubarb and cooking apples are particularly suitable for preserving this way.

Tomatoes Tomatoes may be sterilized in a sterilizer, or in the oven. They are very good if preserved in their own juice. Tomatoes should be skinned, halved or quartered and packed tightly into bottles with a sprinkling of salt and sugar between the layers, allowing ½ oz. salt and ½ oz. sugar to each 2 lb. Tomatoes. Sterilize as for fruit but bring temperature up to 190°F. in 1½ hours and maintain for 30 minutes.

Storage Bottled fruit should be stored in cool, dry, dark place whenever possible. Metal screw bands should be lightly greased with vaseline on the inside and lightly screwed back on the jars. It is advisable to look over one's store from time to time so that any sign of mould or deterioration is detected in its first stages. *J. Roy. Hort. Soc.; Sept. 1943.*

Abstracts

Milking three times a day *(J. Min. Agri. Sept. 1943)* Three times a day milking has often been practised with high yielding cows to obtain exceptionally high yields from a few cows. This practice is extended to obtain an increased yield from all the very ordinary members of a commercial herd. It is known that under natural conditions, with the cow suckling a calf, secretion of milk is stimulated as the appetite of the calf increases, since the udder is sucked dry. By twice a day milking the udder is emptied only twice each day and there are long periods when the udder is relatively full of milk. By three times a day milking, the more frequent empty condition of the udder should stimulate secretion; and in consequence, a greater development of the milk producing tissue and an increased blood supply to the udder should result. If these conditions are obtained during the first lactation, it seems reasonable to expect that the cow would be a more capable producer during succeeding lactations.

The cows are managed well giving them a two month dry period to calve down in good condition. Calves are weaned at birth and the cows milked twice daily for three days and thrice daily thereafter at 5-30 a. m., 1-30 p. m., and 7-30 p. m. This three times milking is continued for six months, that is two thirds of the lactation period. If the cow has not been effectively served by then thrice milking can be continued. There is a fall in milk yield when twice milking is resumed. The cow is eventually dried to develop the embryo and build up her body for the next calving.

Mr. Arthur Amos of Kent, England, who suggests the effectiveness of milking three times a day has a herd of a few cows which averaged only 600 to 750 gallons milk per lactation in 1936. In 1942 the herd averaged 943 gallons of milk by thrice milking. The most outstanding performance was that of a cross bred Fresian Shorthorn, Blue III. which gave only 700 gallons during her first four lactations on the twice a day system. As soon as she was milked three times a day, production jumped to 1435 gallons in the fifth lactation. In her sixth lactation she gave 1800 gallons and her seventh lactation produced 1548 gallons. High yields in the first lactation are followed by increased yields during the subsequent lactations, provided they are properly fed and managed.

Thrice milked cows were regular in breeding and free from disease. The more frequent removal of milk from the udders naturally kept them in good shape. The trial has not been conducted under strictly experimental conditions and the author suggests further studies. A. H. S.

Gleanings

Dehydrated foods for beasts—Dried grass Although the war has stimulated the production of dried grass for cattle food, grass driers have, in fact, been in a process of evolution during the past ten years. * * Some interesting data dealing with grass drying have been given by George G. Pollitt in an article in the book *Britain can Feed Herself*. He states that the advantage of artificially drying grass over making the same grass into silage is that with drying there is practically no loss, whereas in making silage there must always be some loss, in normal circumstances amounting to 20% of the dry matter. Silage when properly made, is an excellent food, and will replace a balanced concentrated food, but whereas the grass from an acre, when artificially dried, will replace at least 2 tons of a concentrated feed properly balanced for milk production; it will only replace 1½ tons when made into silage. Several reasons for drying grass instead of making into hay are given. However good the weather and however well the

hay is made the losses, some mechanical and some due to chemical action, may amount to 50% in a normal season. It is pointed out that when grass is artificially dried it can be cut and conserved immediately it has reached the desired state of growth. When so cut, the yield of protein and the feeding value throughout the season is greater than when the grass is allowed to reach the hay stage. *J. Min. Agri Aug 1943.*

Manufacture of absorbent cotton wool Ordinary raw cotton, as it comes from the ginnery, will not readily absorb water, because mature cotton hairs are covered with a thin coating of wax, which renders them more or less waterproof. If the cotton is boiled in an alkaline solution, the wax becomes saponified, that is it is, converted into a so p which can be washed out, leaving the hairs free of wax, and thus able to absorb liquid.

* * * * *

The production of absorbent cotton can be divided into three parts— (1) opening and cleaning, (2) wet processing, (3) finishing or dry processing.

Before the raw cotton is wet processed it is cleaned, and thoroughly opened (fluffed out), and all dust and dirt extracted. To do this the "blow room" machinery in the spinning mill is used. This consists of a series of machines which open, and tease out the lint and subject it to treatment by powerful dust extracting fans.

Wet processing The clean lint is boiled in what is known as a kier boiler, which consists of an empty boiler shell, to which steam pipes, for heating, are attached.

The raw cotton, about eight hundred pounds at a time, is packed into the kier boiler and the door fastened down by means of heavy screws bolted to the circumference. An alkaline solution is then pumped into the boiler, and gradually raised to boiling point under a steam pressure of 30 lb. This boiling process is continued for a period of eight hours, then the alkaline liquor is run off and replaced by clean soft water. This in turn is replaced by a second supply of water in order to wash out any remaining traces of alkali. The door of the kier is opened, and the boiled cotton extracted and placed in cement vats, where it is bleached with a specially prepared bleaching solution. This solution is subsequently drained off and the moist cotton washed with a further supply of soft water. The cotton is next steeped in what is known as a "souring" bath, consisting of a weak acid to neutralise any alkalinity that may be retained from the previous processes.

After two further washings with fresh water the cotton is squeezed between rollers to get rid of most of the surplus water and then spread out to dry on racks made of small mesh wire netting.

While drying the cotton undergoes natural bleaching and gives the finished commodity its bright white appearance.

Dry processing When the cotton is thoroughly dry it is packed in new clean woolpacks and transferred to the spinning mill, where it again undergoes treatment in the blow room before it goes to the carding engines.

Here the cotton is passed between a large revolving drum covered with very fine, closely set, wire spikes and a series of smaller rollers, similarly covered, but rotating in the opposite direction. The effect on the cotton passing between these rollers is that the individual hairs become separated, drawn out to a certain extent, and parallelised. As the now carded cotton comes from the carding machines it is combed by a rapidly oscillating fine tooth comb, which delivers the cotton in a particularly flimsy, almost transparent, web, on to a large revolving drum.

From this drum the cotton is transferred to the rolling and interleaving machine, which rolls, compresses and wraps the cotton in the outer paper covering. *Rhod. Agri. J. Vol. XV, No. 4.*

'Plowless Farming' "During the last twelve years we have worn out only one plow point. Most of that wear was in the three gardens and in some contour plowing in the pastures. Since giving up 'Farming' we have cut our overhead expenses over 50 per cent and have eliminated all the gullies and galls that had earned for our place the reputation of being the poorest farm in the country. It is years since we have bought any hay. Our purchases of high protein feeds have been cut in half. Our cattle are bigger and they produce 40 per cent more milk with 40 per cent less labour".

Mr. Arnold. G. Ingham, a farmer from Virginia in U. S. A. achieved this feat. He was growing corn for a number of years and found in 1930 that after every crop of corn the field was a mass of gullies 2 to 10 inches deep. It did not require an expert to figure for him that more plant food was washed away than had been taken up by the corn crop. It takes nature 400 years to make one inch of top soil and his had been washing away for over a hundred years, he had farmed by overdrawing on the 'Bank of Fertility'.

It was figured that if that land had been in a good stand of grass there would have been little or no soil erosion. Accordingly he planted a lot of pasture grass and clover seeds. He heard of people who had gone in for pasture fertilisation and had cut down the cost of producing milk and raising cattle. The Dept. of Agriculture showed that the average dairy farmer spent fifty times as much for feed as he did for lime and fertiliser, but that the most successful dairy farms spent nearly half as much for fertiliser as they did for feed. They also showed that cows on grass produced better and cheaper milk than cows fed in the barn. They also showed that young cattle raised on good pasture grew bigger and healthier and are much cheaper than young cattle raised on hay and grain.

In the last 7 years Mr. Ingham used over 1000 tons of lime and 200 tons of fertiliser on 140 acres of grass land. His entire herd is living on hay. He has the bestalfalfa crop. His gross income per cow was $ 300, a year. He also saved his land by 'PLOWLESS FARMING'. *Soil Conservation, August 1943.*

For washing milk separators Milk separators require careful attention. If they are left unwashed, enormous numbers of bacteria grow in the residue in the bowl and other parts and are picked up by the cream at next separation. This is one of the chief reasons for poor quality cream. For best results the separator must be thoroughly washed and scalded after each run. If for any reason this is not done, the keeping quality of the cream may be improved by the following treatment; with the bowl turning at full speed, pour a pialful of hydrochlorite solution into the supply tank. Brush the inside of the tank with this solution, then allow it to run through the machine. This will rinse out and destroy many bacteria and prevent them contaminating the cream when the milk is run through the machine—*Dept. of Agriculture, Canada. Indian Farming, May 1943.*

New committees for tobacco, sugar, rice and coconuts Tentative decisions have been reached to set up four new committees, on the model of the Central Jute or Central Cotton Committee, which will deal with tobacco, coconuts, rice and sugar. The necessary legislation will shortly be undertaken to implement the decision. The Central Committees on Rice and Coconuts will be financed by levy of a small cess, while the other two committees will be financed by contributions from the Sugar and Tobacco Excise Duties.

The proposal to set up a Coconut Committee has alreay been approved by the Governments of Madras, Mysore and Travancore, and negotiations are at present in progress to bring in Cochin before the legislation is undertaken.

Similarly the proposal to set up a Rice Committee is under discussion with the Provincial Governments. It envisages the levy of a small cess of say one

pice a maund on milled rice. This is expected to yield Rs. 30 lakhs a year. In view of the urgency of the problem the Committee might be set up by ordinance. The Sugar and Tobacco Committees will be set up by a resolution of the Government of India.

As for tobacco Rs. 10 lakhs have been provided from the Tobacco Excise Duty and it is now proposed to establish a Central tobacco station at Guntur to study fundamental problems connected with tobacco. Mr. Cocks has been appointed Tobacco Adviser to the Government of India. There will be four experimental stations for cigarettes (Virginia), *hukka*, *bidi* and cigar tobaccos. These stations will be located at Guntur, Puri, Anand (Guzerat) and Trichinopoly respectively. There will be twenty sub-stations in tobacco producing provinces, such as Bengal, United Provinces, Punjab, Bombay and in the West Godaveri District of Madras. On the development side a staff will be employed to encourage cultivators to introduce improved strains of tobacco, to organise growers' co-operative societies, to enable them to own their curing barns and warehouses. *The Mail, December 11, 1943.*

Research Notes

Three new insect pests in the Madras Presidency

This year is rather notable in the fact that three insect pests which are not known to be present previously in this Presidency have made their appearance in quick succession. They are (i) the granary weevil-*Calandra granaria*, (ii) the San Jose scale—*Quadraspidiotus perniciousus* and (iii) Khapra beetle—*Trogoderma Khapra*.

The granary weevil which is closely allied to the rice weevil--*C. oryzae*—is a well known pest of wheat in storage and is known to thrive best in temperate climate. In India it is known to occur in the Punjab in small numbers. This was first noticed in Madras in the wheat stocks from Australia in May, 1943.

The San Jose scale is a notorious pest of fruit trees such as apples, plums, citrus, pears etc. in different parts of the world. This is known to be present in the Punjab, United Provinces, North West Frontier Provinces and Kashmir. More recently it was noticed infesting apple seedlings in Coonoor.

The Khapra beetle is a well known pest of wheat, pulses and maize in the Punjab, the United Provinces, etc. This has come to be noticed in November in appreciable numbers in Bengal gram stocks recently imported into Madras from North India. The infestation of this pest was more pronounced in grams severely affected with the pulse beetle—*Bruchus analis*.

Agricultural Research Institute, Coimbatore, 1st December 1943 — M. C. Cherian, Govt. Entomologist

Correspondence

To

The Editor, Madras Agricultural Journal.

Sir,

In a letter to the Editor, *Science and Culture*, written by T. Hussain, R. C. Guha and B. Mukerje, and published in Vol. IX, No. 4, October 1943 page 167, under the heading, *Polygala chinensis* Linn. as substitute for 'official' senega, the authors state, after giving details of the results of the analysis of the respective roots of *Polygala chinensis* and *Polygala senega* and of their respective tinctures, that Tincture senega from *P. chinensis* has now been in use in several Governmental hospitals and dispensaries for more than six months as an important constituent of 'stimulant expectorant' mixtures, and physicians have not had any evidence of its lack of efficacy as compared to Tinct. senega from *P. senegal*. The authors

add that this is an indirect evidence that the change of the species is not of much therapeutic significance and that with slight modification in chemical standards, *P. chinensis* may therefore be included in the B. P. and B. P. C. and Indian manufacturers need not depend on imported *P. senega*. It might interest the readers to note that this valuable medicinal plant, *P. chinenses*, is found very commonly throughout the Madras Province, in all dry districts, from the plains to 3,000 ft. In Coimbatore it is a very common weed in black soil. In this connection, it may be mentioned that Coimbatore is fairly rich in a number of other medicinal plants also for which there is a great demand.

Agricultural College & Research Institute Lawley Road P. O. Coimbatore.

S. N. Chandrasekharan, Lecturer in Botany

Sir,

The use of Tamarind seed as cattle feed

The use of tamarind seeds as sizing material for cotton yarn and the discovery of a very rich source of pectin in the seeds have been published in a recent issue of the *Madras Agricultural Journal* The seeds have been used as sizing material for local blankets from time immemorial. The demand from this source was not, however considerable But the seeds have considerable demand as cattle feed. Chiefly milk buffaloes, goats and pigs and even work bullocks are fed with roasted and soaked seeds. As a result the price, which was 4 to 8 annas per palla (100 seers), rose to one to three rupees, and this year the seeds were in demand at Rs. 7 per palla!

The seeds are roasted on a large pan about 18 in. x 30 in. in size (made of kerosene tin material) having a number of perforations. While still hot, cold water is sprinkled on the seeds to facilitate the removal of the seed coat. They are then pounded to remove the husk, cleaned and stored. Before feeding, their seeds are soaked preferably in hot water for 24 hours. 100 seers of raw seeds give about 60 seers of roasted seeds and the cost of roasting and cleaning comes to a rupee. The roasted seeds were sold and purchased at Rs. 14 per palla this year when food stuffs like *ragi* were sold at Rs. 20.

Usually 2 to 3 seers are given to milk buffaloes. Larger quantities might cause digestive troubles. In the taluks of Kalyandurg, Madakasira and Hindupur and the adjoining taluks of the Mysore state, the seeds are largely fed to cattle.

Whether the tamarind seeds can be classed with concentrates like cotton seed, dholl husk etc., is a matter for investigation.

Pothaganahalli, Tumkur Dt. 7—11—1943

P. Rama Rao

[The roasted tamarind kernels contain 16·12 per cent of crude proteins, 6·32 per cent of fats, and 61·47 per cent of carbohydrates and are fairly good feed for cattle.—*Ed. M. A. J*]

Review

"**Cryptostegia Grandiflora** R. Br.—A war time source of vegetable rubber"—By B. Viswa Nath—Journal of Scientific and Industrial Research, 1943. pp. 335—383. The article describes briefly the more important results so far obtained from the co-ordinated and co-operative investigations on *Cryptostegia grandiflora* by the Imperial Agricultural Research Institute, New Delhi, under the direction of the author. The results of these investigations have enabled definite recommendations to be made, of methods for quick and large scale propagation of the plant and for the extraction of rubber from it. Although *cryptostegia* latex is poorer than that of *Hovea* cryptostegia rubber could be utilised even for high grade mechanical rubber if all the processes involved from coagulation to smoking were carefully controlled.

Cryptostegia grandiflora is a large woody shrub with conspicuous pale purplish funnel shaped flowers and characteristic whip-like branches which twine and climb over fairly tall trees. It is latescent throughout, the stem, leaves and fruits, exuding a milky latex when cut In India it has been found growing throughout the length and breadth of the country and appears to be remarkably adaptable to vide variations in environment.

The plant can be propagated easily both by stem cuttings and by seed. Propagation by seed is to be preferred to propagation by cuttings for obtaining quick results. Seeds are produced in fair abundance and are highly viable. Seedlings may be raised in the nurseries and transplanted or the seeds may be directly sown in the field according to circumstances of locality and weather. Presoaking of seed in water eliminates light, nonviable and damaged seeds by floating and secures larger, quicker and more uniform germination. Raising of nurseries and transplantation of seedlings is ordinarily to be preferred to broadcasting the seed. Seed rates for nursery and field planting have been worked out and methods of raising nurseries and transplanting have been recommended.

The latex cells in the plant are distributed throughout the tissues and for this reason tapping for latex is best done by clipping of the branches of suitable size and collecting the latex that drips Tapping during the latter part of the day gives larger yields than tapping during the early part of the day. In regard to frequency, tapping once in three days is more economical than alternate day and daily tapping from the points of view of the health of the plant, economy in labour and cost. It is not advantageous to tap during the defoliation period. "Plug", the small ball of rubber that collects at the cut-end after the dripping of the latex has ceased, forms a very important source of rubber and its yield in hot months is even greater than that of rubber from latex A point of considerable and immediate practical interest that emerges from this observation is that, if and where necessary the collection of latex can be omitted but the plants can be clipped as for tapping and the plugs collected This method of plug collection may be employed for dealing immediately with the existing wild growth of *Cryptostegia* in different parts of the country.

A method of water coagulation for latex has been evolved. An addition of twenty volumes of water brought about coagulation of the latex. But when the latex is diluted with water warmed to 80 to 90 C. the dilution required is reduced to six to eight volumes to bring about coagulation. This method has the advantage of simplicity and cheapness.

Tapping for latex is an expensive item in the production of rubber from *Cryptostegia grandiflora* and requires a large force and equipment. The cost of producing rubber from this plant is not mentioned. It would have been better if this had been worked out and given so that the enthusiastic public may be induced to grow this as a short term rubber crop. Nevertheless this timely publication, when there is an all out effort by the United Nations to increase the out put of rubber to meet the shortage resulting by the occupation of the rubber producing countries, like Malaya and Dutch East Indies, by the Japanese, will be of immense value.

T. V. R.

Crop and Trade Reports

Paddy—1943-44—Second forecast report The average area under paddy in the Madras Province during the five years ending 1941-42 represents 13.3 per cent of the total area under paddy in India The area sown with paddy up to 25th November 1943 is estimated at 9,523,000 acres. When compared with the area of 9,149,000 acres estimated for the corresponding period of the previous year, it reveals an increase of 4·1 per cent.

An increase in area is estimated in all the districts of the Province except in Kurnool, Anantapur, Chingleput, Salem, Coimbatore, Trichinopoly, Tanjore and

Ramnad. The increase in acreage is due partly to timely rains at the time of sowing and partly to the propaganda to grow more food crops. The variations are marked in East Godavari (+110,000 acres), West Godavari (+70,000 acres) Kistna (+72,000 acres), Chingleput (−97,000 acres), Chittoor (+110,000 acres), North Arcot (+75,000 acres) and Tinnevelly (+65,000 acres). The first crop of paddy is being harvested in parts of the province. The yield per acre is expected to be normal in West Godavari, Kurnool, Bellary, Cuddapah, Nellore, Chittoor, North Arcot, Salem, Ramnad, Tinnevelly and the Nilgiris and slightly below the normal in the other districts of the province. The seasonal factor for the Province as a whole works out to 96 per cent of the average as against 91 per cent in the corresponding period of the previous year. On this basis, the total yield is estimated at 92,730,000 cwts of cleaned rice as against 83,760,000 cwts. estimated for the corresponding period of the previous year, representing an increase of 10·7 per cent.

The wholesale price of paddy, second sort, per imperial maund as reported from important markets on 11th December 1943 was, Rs. 8–4–0 in Mangalore, Rs. 7–15–0 in Madura, Rs. 6–8–0 in Vellore, Rs. 6–7–0 in Rajahmundry, Rs. 6–5–0 in Guntur, Rs. 6–3–0 in Ellore and Masulipatam, Rs. 6–0–0 in Tinnevelly, Rs. 5–15–0 in Cocanada and Bezwada, Rs. 5–12–0 in Trichinopoly, Rs 5–3–0 in Chittoor, Rs 4–15–0 in Kumbakonam Rs. 4–14–0 in Negapatam, Rs. 4–5–0 in Conjeevaram and Rs. 4–4–0 in Cuddalore. When compared with the prices published in the last report, i. e., those which prevailed on 6th November 1943, the prices reveal a rise of approximately 18 per cent in Rajahmundry, 10 per cent in Trichinopoly, 9 per cent in Mangalore, 6 per cent in Conjeevaram, 3 per cent in Cuddalore, 2 per cent in Cocanada and Guntur and 1 per cent in Masulipatam and a fall of approximately 3 per cent in Madura, and 2 per cent in Bezwada, the prices remaining stationary in Ellore, Vellore, Kumbakonam, Negapatam, and Tinnevelly.

Sugarcane 1943 – Intermediate forecast report The condition of the sugarcane crop is generally satisfactory outside Vizagapatam, where the crop is reported to have been damaged by cyclonic winds in parts of the district and Kistna where the crop is reported to have arrowed profusely. The yield per acre is expected to be normal except in the above two districts.

The wholesale price of jaggery per imperial maund as reported from important markets on 4th December 1943 was Rs. 15–13–0 in Erode, Rs. 13–15–0 in Coimbatore and Mangalore, Rs. 13–12–0 in Adoni, Rs. 13–5–0 in Cuddalore, Rs 13–3–0 in Rajahmundry, Rs. 13–0–0 in Ballary, Rs. 12–3–0 in Cocanada and Salem Rs. 12–0–0 in Chittoor, Rs. 11–0–0 in Vizianagram and Vizagapatam, Rs 10–9–0 in Trichinopoly and Rs 9–8–0 in Vellore. When compared with the prices published in the last report, i e., those which prevailed on 6th November 1943, these prices reveal a rise of approximately 12 per cent in Adoni, 9 per cent in Vizianagaram and Bellary, 6 per cent in Trichinopoly and 4 per cent in Cuddalore and a fall of appproximately 19 per cent in Vizagapatam and 5 per cent in Salem; the prices remaining stationary in Cocanada, Rajahmundry, Chittoor, Vellore, Erode and Mangalore. *(From the Commissioner of Civil Supplies, Madras)*

Cotton, Raw, in the Madras Province The receipts of loose cotton at presses and spinning mills in the Madras Province from 1st February to 19th November 1943 amounted to 384,793 bales of 400 lb. lint as against an estimate of 406,300 bales of the total crop of 1942-43. The receipts in the corresponding period of the previous year were 670,458 bales. A total quantity of 580,352 bales mainly of pressed cotton was received at spinning mills and 3,470 bales were exported by sea while 232,260 bales were imported by sea mainly from Karachi and Bombay. *(From the Director of Agriculture, Madras)*

Mofussil News

Late V. Karunakaran Nair, B Sc (Ag) Sri V. Karunakaran Nair as Agricultural Demonstrator, Sivaganga for a short period of about two years, endeared himself not only to the *ryot* population of Sivaganga but to the public at large, by his devotion to duty, solicitude to the welfare of the poor *ryot*, and his amiable disposition, tact and ability to satisfy the intelligentia, who are generally the critics of our work. He could win the affection of the public so much that on hearing of his sudden demise due to typhoid they resolved to present a portrait of his, to the Agricultural Demonstrator's Office, Sivaganga. The Director of Agriculture was pleased to accord the necessary permission. The portrait was unveiled by Sri G. Damodara Rao, B.A., B.L., District Munsiff in the presence of a large gathering of the elite of the town. The president paid a touching tribute to the departed soul before he unveiled the portrait. The District Agricultural Officer Ramnad, thanked the public and formally accepted the portrait on behalf of the Department and put it up in a prominent place in the office.

K. N. D.

Exhibition at Ramnad An Agricultural exhibition was held from 5th to 9th November 1943 in connection with the birth-day celebration of the Sethupathi Raja Sahib of Ramnad. The show was put up in the tastefully decorated frontage of the Paliampatti Zamindar's bungalow; Grow More Food posters and placards were given a prominent place in the get up. Improved strains of paddy, *cholam ragi* and *cumbu*, specimens of *kolingi*, *dhaincha*, sunnhemp, fodder crops, potatoes, vegetables and fruits, and seedlings of economic trees like *vagai*, *vembu*, casuarina and *Glyricidia maculata* were on show. The vitamin value of food stuffs, especially of green leafy vegetables and home pounded rice, with practical demonstration with 'Annapurani' hand rice sheller were a special feature. The plant pathology posters and specimens, sprayers and chemicals were also exhibited. The implements and apiculture, with practical demonstrations were very much appreciated. The 'Ryots' Day and 'Students' Day were specially crowded. The exhibition has served its purpose splendidly well in this backward tract.

M. P. S. N.

Agricultural Exhibition at Tiruvannamalai An agricultural exhibition was held at Tiruvannamalai from 1st to 10th December 1943, during the Karthigai Deepam festival. This is one of the major exhibitions in the North Arcot District where nearly a lakh of people come to the festival. A special feature of the exhibition was the impetus given to the Grow More Food campaign offering prizes to those who paid special attention to the cultivation of vegetables. The grant of Rs 15 kindly granted by the Collector of the North Arcot District was utilised for awarding prizes to some of the vegetable exhibits. A pumpkin weighing 63 lb. an amaranthus plant of over 15 ft. in height, a drumstick and ribbed gourd, nearly 3 ft. long, a chilli plant (Guntur strain No. 498) having a viss (3 lb.) of green chillies in one plant, big sized beans, brinjals etc., were some of the exhibits. The Fruit Specialist, the Curator, Botanic Gardens, Ootacamund, the Millet, Paddy and Oil Seed Specialists and the Agricultural Chemist sent interesting exhibits. Locally prepared biscuits, cakes, bun and bread from *ragi* flour attracted the attention of the visitors and over 10 000 *ryots* visited the stall nearly 400 packets of vegetable seeds were sold on the spot and the demand could not be completely met with.

M. A. B.

Madura District—An Ideal Farmer Mr. W. P. A. Soundara Pandia Nadar, a large land holder of Pattiveeranpatti village, Nilakottai Taluk, Madura District, is a practical farmer even though he is very busy in publicaffairs having been elected recently as the president of the District Board. He takes particular pride in contributing to the increase of food production in his lands.

In a block of 100 acres under a tank which receives its supply from the seasonal rains, only one crop of paddy used to be raised. But during the past year he proceeded with a determination to produce at least two crops. He did succeed. Bat he did not stop there. Due to a lucky shower in the summer, a small supply of water had accumulated in a tank, and he sowed a short duration paddy in 36 acres. The crop grew well but it was feared that the water supply would run short and the crop would fail. He managed to get the required fuel, which is difficult to get now and worked an oil engine and pump for baling water from a big well in his lands and succeeded in getting the crop to maturity. The yields of food grains were as follows.—

First crop: 50 acres under the fine popular variety of rice, GEB. 24, known locally as *Doppi samba* and 50 acres under another local *samba* were raised. The yield was 2.200 cwt. of paddy.

Second crop: He raised 50 acres under a short duration paddy and 50 acres under white sorghum and from this he got 1.400 cwt. of grains.

Third crop: He could grow a crop only on 36 acres as detailed above and he got 576 cwt. of paddy,

In all he got 4,176 cwt. of grains from 100 acres, besides Rs. 4,000 worth of straw to feed his cattle. From one crop he got in the previous year 2,240 cwt, of paddy only.

Apart from producing more food the monetary gain is also appreciable. During the previous year he spent Rs 4 000 and realised Rs. 20,160 worth of grains. In this year, he spent Rs. 8,260 and obtained Rs. 37,584 worth of grains. The net returns for the two years are Rs. 16 160 and Rs. 29,324 respectively. Besides these, he was able to provide food to a large number of labourers by growing more than one crop and they were all paid in kind for planting and harvest. He is rightly proud of these achievements.

College and Estate News

Students' Corner The students' club activities were nil as the students were busy preparing for the December Terminal Examinations which were held on 9th, 10th and 11th December 1943.

Games *Hockey* Two matches were played with the Ev cuees, one of which ended in a draw and in the other the college team won The first match of the Parnel Cup tournament was played between the I and II year class and the latter came out successful In the finals of the Coimbatore Athletic Association tournament we were defeated by the Sporting Union.

Cricket Three matches were played of which two were with the Officers XI and the other with the Merchants XI. The following were the scores.

1st Match Students' XI 107 (A. S. Alwa 46 not out); Officers' XI 110 for 6 (N. M. Naidu 26. V. Pai 3 for 23).

2nd Match Students' XI 100 for 5 wickets (A. S. Krishnan 50); Officers' XI 98 (Dr. Venkataraman 34; R. Narasimhan 5 for 33).

3rd Match Students' XI 109 (A. C. Krishnan 36); Merchants' XI 63 (Nagarajan 30, R. Narasimhan 4 for 20).

Visitors Lient. Gen. Hutton, Post-War Reconstruction Officer and P. H. Rama Reddi Esqr., Director of Agriculture visited the Agricultural College and Research Institute, during the month.

Chinese Agricultural Mission Dr. Pan, Dr. Ma and Mr. Chiu of the Chinese Agricultural Mission visited the Agricultural College and Research Institute from 10th to 13th December '43 They visited the several research sections and stations. They were entertained at tea by the Principal and the heads of sections at the Agricultural College, and by Dr. N. Parthasarathy at the Imperial Sugarcane Station, Coimbatore.

Departmental Notifications

Gazetted Service—Appointment, Postings and Transfers

Sri H. Shiva Rao, Assistant Agricultural Chemist, is appointed to act as Government Agricultural Chemist, Coimbatore with effect from 19--8—43.

Sri S. Venkatarama Ayyar, Farm Manager, Agricultural Research Station, Palur to District Agricultural Officer, Guntur.

Sri V. K. Subrahmanya Mudaliar, District Agricultural Officer on leave to be District Agricultural Officer, Kurnool.

Sri K. Jagannatha Rao, officiating District Agricultural Officer, Kurnool, to be District Agricultural Officer, Cuddapah.

Sri Rao Saheb B. S. Nirody, on return from leave, will resume the post of Special Officer for Vegetable Cultivation, Coonoor.

Leave

Sri U. Vittal Rao, District Agricultural Officer, Cocanada l. a. p. for 4 months and on half average pay for 24 months from the date of relief, preparatory to retirement.

Sri P. Subramanyam, D. A. O. Cuddapah, l. a. p. for 1 month from the date of relief.

Subordinate Service—Postings and Transfers

Name of officers	From	To
Sri C. Venkatachelam	A. D. (on leave)	F. M. A. R. S. Maruteru
,, M. Achanna Sastry	F. M. A. R. S. Maruteru	A. D. West Godavari Dt.
,, M. Subramania Chetti	F M. A. R. S. Hagari	A. D. Hosur
Janab Muhammad Obeidullah Sahib	F. M. Koilpatti	F. M. A. R. S. Hagari
Sri S. Ramachandra Ayyar	A. D. Ponneri	A. D. in charge of the Colonisation Scheme at (Uluvur) Paruthikottai, Tanjore Dt.
,, S. Mayandi Pillai	Asst. in Cotton, A. R. S. Nandyal	Asst. in Cotton, Coimbatore
,, P. N. Krishnaswami Rao	Asst. in Cotton, Coimbatore	Asst. in Cotton, A. R S. Nandyal
,, V. Achutham	A. D. Tiruvur	Food Inspector, Tadepallegudem (under Grain Purchase Officer)
,, K. Bhaskaram	F. M. A. R. S. Samalkota	do. do.
,, P. Somayajulu	A. D Ramachandrapur	do. do.
,, S. Sithapathi Rao	Food Inspector, Cocanada	A. D. E. Godavari Dt.
,, P. Sudarsanam	A. D. Gurzala	A. D. to work under the Asst. Agricultural Chemist (compost scheme) at Bezwada
,, A. K. Ramasubba Ayyar	A. D Palladam	do. do.
,, U. S. Ayyaswami Ayyar	A. D. Tiruvarur	A. D. in charge of the Colonisation scheme-- Uluvur—Paruthikottai, Tanjore
,, M. J David	A. D Mannargudi	do. Kangayampatti, Tanjore
Janab K. A. Shaukat Ali Sahib	A. D. Trichinopoly	Marketing Asst. to work under the Grain Purchase Officer, Tanjore
Sri C. Ramakanta Reddi	A. R S. Samalkota	Marketing Asst. to work under the Grain Purchase Officer, Bezwada

Janab Md. Zainulabdeen Sahib	Asst. in Paddy, Rice Sub-Station, Buchireddipalam	A. R. S. Samalkota
Sri C. Ekambaram	F. M. S. R. S. Gudiyatham	A. D. North Arcot Dt.
" K. R. Sundaresan	A. D. North Arcot Dt.	F. M. S R. S. Gudiyatham
" V. V. Jagannadha Rao	A. D Patapatnam	A. D. Vizagapatam
" G. Venkatakrishnan	A. D. Periakulam	A. D. Salem
" M. Narayana Ayyar	A. D Hosur	A. D. Periakulam
" V. M. Ramuhuni Kidavu	A. D. (on leave)	A. D. Hosur
" M. P. Gourisankara Ayyar	A. D Devakottah	A. D. Trichinopoly

The following upper subordinates are appointed as Agricultural Marketing Assistants under the Provincial Marketing Officer for grading and marketing of rice and are posted to the stations noted against them.

Name of officers	Stations to which posted
Sri V. Mahimai Doss, Marketing Asst. Grain Purchase Office, Tanjore	Mannargudi
" George Maduram, Probationary, A. D. Tinnevelly Dt.	Tiruvarur
" M. Kasiviswanathan, A. D Kadiri	Kuttalam
" K. V. Natesa Ayyar, A. D. Gudiyattam	Chidambaram
Janab D. A. Syed Mohammad Sahib, A. D. (under training) Hosur	Trichinopoly
Sri K. Moorthy Raju, A D (under Training) Kandakur	Bezwada
" K. Narayana Rao, A. D. Hadagalli	Gudivada
" N. Srinivasulu, A. D (under Training) Tadepalligudem	Bhimavaram
" K. Raghunatha Reddi, Marketing Asst. Grain Purchase Office, Bezwada	Nellore
" S. T. Srinivasan, A. D (under Training) Ramnad Dt.	Madras

Leave

Name of officers	Period of leave
Sri U. S Ayyaswami Ayyar, A. D. Tiruvarur	L a. p on m. c. for 2 months from 4—12—43
" K. M. Narayanan, F. M. A. R. S. Nanjanad	L. a. p for 40 days from 22—11—43
" P. N. Krishnaswami Rao, Asst. in Cotton, Coimbatore	L. a. p. for 6 weeks from 29—11—43
" T. R. Naganatha Iyer, Sub Asst. College orchards--Coimbatore	L. a. p for 4 months from 8—12—43.
" S. Bhima Raju, A. D. (on leave)	Extension of l. a. p on m. c. for 3 months from 17—11—43
" S. Venkataraman, A. D. Nannilam	L. a p on m. c. for 4 months from 29—9—43
" K. Satyanarayanamurthi, Asst. in Cotton, A. R. S Hagari	L a p. for 30 days from 22—11—43
" K. Cherian Jacob, Asst. in Botany, Coimbatore	Extension of l. a p. on m. c for 2 months from 24—11—43
" P. S. Venkuswami Ayyar, A. D. Chingleput	L. a. p. for 2 months from 2 -1—44

Foreign Service

The services of Dr. R Kochukrishna Pillai, Assistant in Chemistry, Coimbatore, is loaned to the Council of Scientific and Industrial Research for employment as Technical Assistant, under the Director of Scientific and Industrial Research, Delhi.